FEBRUARY, 1961

RUBBER WORLD

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MAR 2 1961
TECHNOLOGY DEPARTMENT

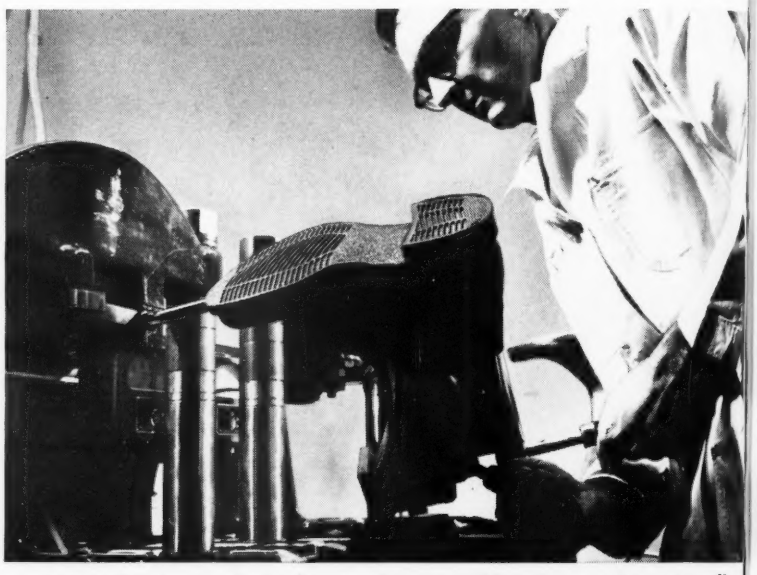
Follow the Bouncing Balls

BULLETIN:

Shell Chemical tears brand-new shoes apart in the search for better footwear, flooring, tires and bottle nipples

Shell's Technical Service Laboratory is a department of self-criticism. Every new rubber that Shell develops must make the grade here before it can be sold.

Read about the men who run this laboratory—the unusual way they are helping the shoe industry find new polymers and manufacturing methods—and how they can help your company solve costly problems.



A Shell Chemist puts the finishing touches on a mold-on shoe sole. Next, he will tear it apart for analysis. This is one of many tests at Shell's Technical Service Laboratory that aid in the discovery of new and more economical rubber polymers.

THE MEN at Shell Chemical's Technical Service Laboratory are practically jacks-of-all-trades. Recently, they became cobblers.

To develop new rubber and processing techniques for the footwear industry, Shell installed three shoemaking machines. Each machine cures a rubber sole and molds it onto a shoe top.

Shell tears new shoes apart

The shoes made by Shell do not stay in one piece for long. They are deliberately torn apart for thorough testing.

Shell technicians then study the sole. Its color. How it adheres to its top. And the most economical way to make each shoe.

This analysis results in new and better polymers and production methods for shoe manufacturers. And better soles and heels for their customers.

This work with shoe polymers also pays off in other products. They range from heavy-duty tires to bottle nipples. Shell Chemical's SP-103 makes durable floor tile as well as shoe soles. And the easy processability of Shell's S-1509, useful in the mold-on sole process, is also an advantage in making automotive sponge. New applications are being found every day.

Shell's first customer

New Shell polymers and latices encounter rigid testing and analysis by these experts. That is why this laboratory is called "Shell's first customer."

But sometimes manufacturing problems arise even with fully accredited polymers. When this happens, Shell is ready to go to work at once.

Many special application problems are solved in the laboratory in a matter of hours—others take days. If a problem calls for on-the-spot assistance Shell sends its men to work with the plant's own technical staff.

Moneysaving help

If Shell Chemical's Technical Service Laboratory can help you solve a costly problem, call your Shell representative. Or write Shell Chemical, Synthetic Rubber Division, P.O. Box 21[illegible] Torrance, California.

A Bulletin from

Shell Chemical Company

SHELL

Synthetic Rubber Division

RUBBER WORLD, February, 1961, Vol. 143, No. 5. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 3rd & Hunting Park Ave., Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U.S.A. Second Class Postage Paid at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States $5.00 per year; Canada $6.00; All other countries $10.00. Single Copy 50¢ in U.S.; $1.00 elsewhere. Address Mail to N. Y. Office. Copyright February, 1961, by BILL BROTHERS PUBLISHING CORP.

News about

B.F.Goodrich Chemical *raw materials*

Inset shows Hycar sleeve with tube to discharge fuel leakage for B-58 "Hustler" bombers manufactured by Convair Division of General Dynamics Corporation. Immel Engineering and Development Company, Dallas, molds the sleeve of Hycar nitrile rubber supplied by B.F.Goodrich Chemical Company.

B-58's mid-air refueling hazard reduced by Hycar

As a safeguard against leakage of volatile jet fuels, each B-58 Hustler uses sleeves made of Hycar nitrile rubber around the connection with the tanker plane's fueling pipe. Each sleeve has a tube that escorts any leaked fuel out of the plane—safely away from danger.

The flexibility of rubber is needed for this sleeve, but many properties ordinary rubber can't provide are also needed. That's why Hycar was chosen. Tough and long-lasting, it retains its flexibility even at low temperatures of high altitudes. And it is highly resistant to change when exposed to all types of petroleum base fuels.

Here's another unusual performance problem solved by Hycar. It may help you solve a problem, make possible a new application, or even a new product. For information, write Dept. MD-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

RUBBER WORLD

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Cover: Photo courtesy of United States Rubber Co.

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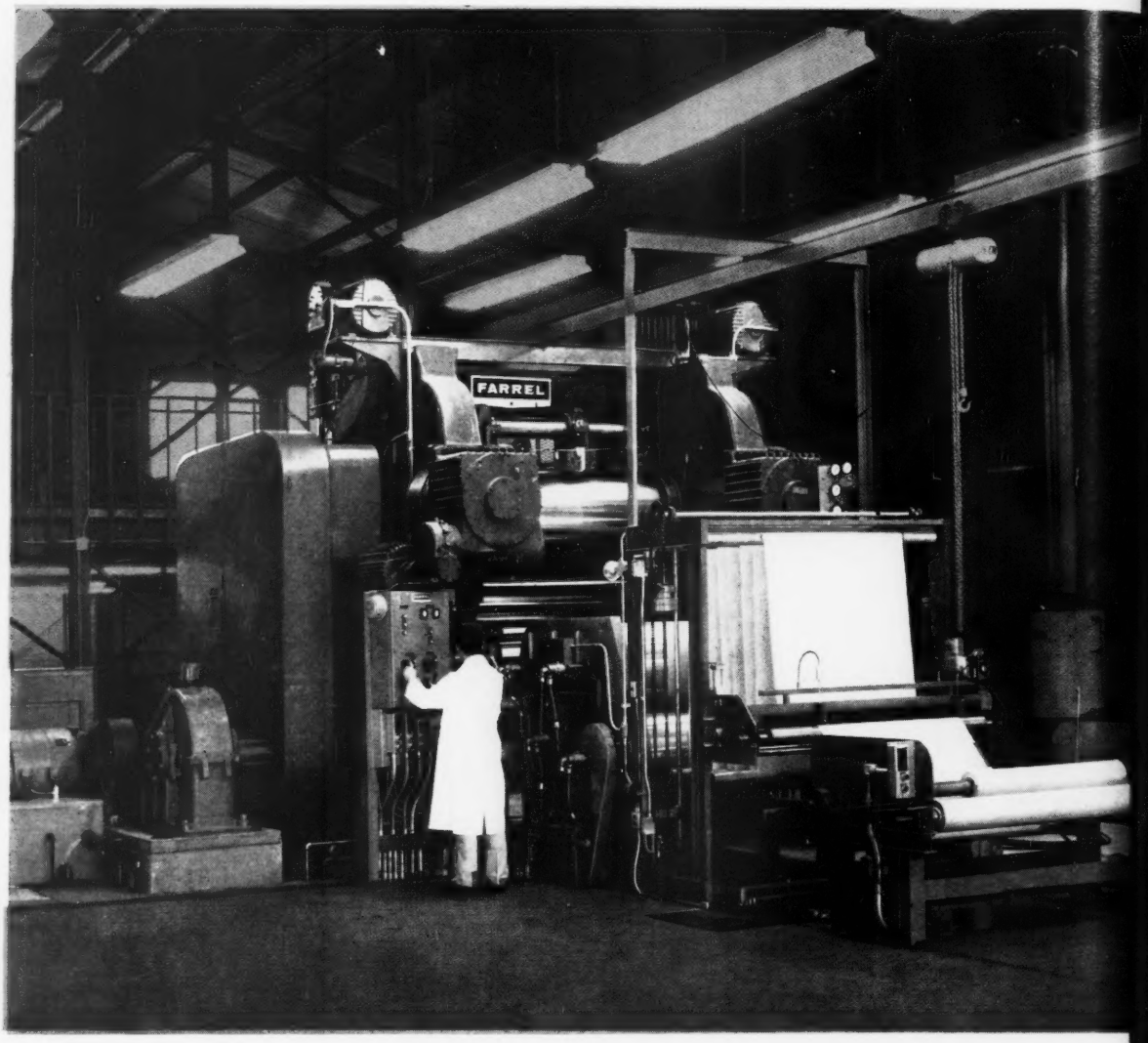

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—says Ellay Rubber Company, Inc.

As an acknowledged leader in the manufacture of continuous vinyl film and sheet, Ellay Rubber Company knows calendering . . . and knows what fine calendering can do to improve the quality of plastics products. That's why, when recently selecting a new machine for their plant in Los Angeles, the choice was Farrel.

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The calender has a range from .0019″ to .020″ and is complete with motorized pick-off roll, embosser, cooling rolls, trimmer and winder.

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FB-1209

news of the rubber world

February, 1961

The stereo specific elastomers battle promises to wax hotter when Goodyear gets its plant on stream. In announcing the capital expenditures program for 1961, Board Chairman E. J. Thomas said that isoprene monomer production would be part of the Beaumont, Tex., facility, indicating that Natsyn (polyisoprene) would be made in quantity along with the expected Budene (polybutadiene).

Goodrich-Gulf has announced start of construction of the plant at Institute, W. Va., for production of Ameripol CB and thus will join the polybutadiene segment of the industry later this year. Twenty-million-pound annual production is expected by the end of this year.

South America will soon have production facilities for rubber chemicals, SBR, and carbon black added to the growing rubber industry on that continent. Cities Service, Continental Oil, U. S. Rubber, Witco Chemical, and Fish Engineering will join to produce butadiene and styrene and combine them into SBR and to produce antioxidants in Argentina. Cabot will build a 30-million-pound per year oil furnace black plant also in Argentina; while United Carbon plans a 20-million-pound per year plant in Venezuela.

"We want quality rubber parts" has become a veritable standard cry on the part of many customers and is a regular part of the discussions whenever rubber men gather. Quality control procedures are well known and are readily obtainable by anyone seeking them. Putting them into practice, however, is often difficult in an established plant. Getting through the workers' resistance is often a major chore. A workable and proven plan actually used in a rubber manufacturing plant for training inspectors and supervisors in QC work is presented in this issue on page 86.

(Continued on next page)

news of the rubber world

Current listings of available rubbers, latices, and some resins will be featured in various issues of RUBBER WORLD. This month we are running the styrene-butadiene resins (page 82). The SBR listing appeared last August and will be updated in the near future. Next month a list of all synthetic latices will be run. Future issues will carry information on some other synthetic rubbers. The information in these listings is taken from the up-to-date material sent in by suppliers for the new third edition of "Compounding Ingredients for Rubber" which is now on press and will be mailed within a week or so to those who sent in advance orders.

Carbon black and talc combination appears to improve the physical properties of certain compounds, according to work done by Sierra Talc researchers. Depending on the compounding technique used, increased tensile, compression set, tear, modulus, and hardness were realized along with lower Mooney viscosity, shorter optimum cure, lower heat buildup, and lower nerve of the compound. Some results of these studies are presented on page 84.

The rayon versus nylon tire cord fight seems to have become based more on quality rather than on price as has been the case over the past year or so. New grades with improved characteristics are coming on the scene. Recent improvement in the rayon picture has permitted American Enka to restore some of the salary cuts made during the low point last year and has also permitted some slight restoration in the price of rayon. The long-term outlook as to which fiber, rayon, nylon, or some other, finally emerges as the major tire cord, however, is still very much in doubt.

The effectiveness of carbon black as a reinforceing agent in rubber is well known. Not so well known are some of the mechanics and reasons for this reinforcement. Major work toward unlocking more of the secrets of carbon black goes on continuously. A Columbian Carbon research team has been studying effects of the carbon black surface on reinforcement and finds that the carbon surface itself plays the major role; while combined oxygen on the surface plays a minor role. The report of this study into the chemical effect of carbon black reinforcement upon rubber appears on page 73.

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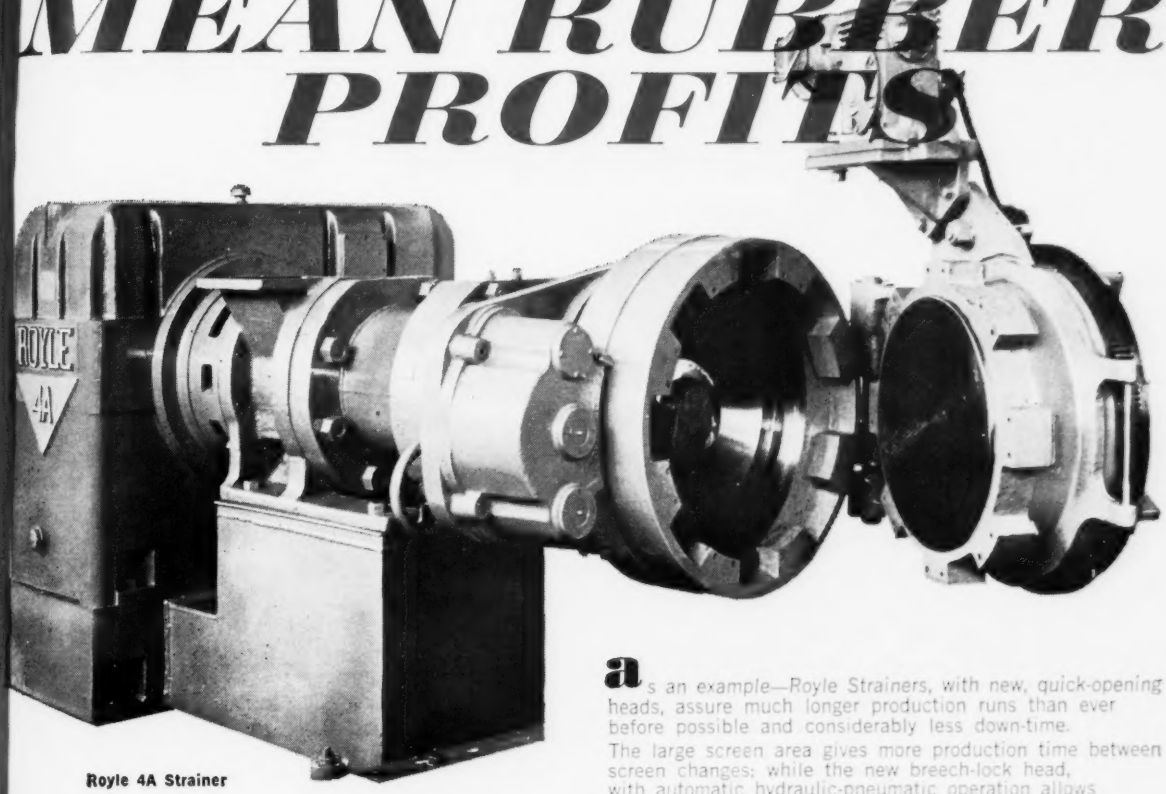
ROYLE STRAINERS MEAN RUBBER PROFITS



Royle 4A Strainer

As an example—Royle Strainers, with new, quick-opening heads, assure much longer production runs than ever before possible and considerably less down-time.

The large screen area gives more production time between screen changes; while the new breech-lock head, with automatic hydraulic-pneumatic operation allows for quick screen changes.

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Heavy Duty Gear Case—with self-lubricating, opposed helical gears that were Royle designed and engineered specifically for strainer operations.

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John Royle & Sons, 6 Essex Street, Paterson 3, N. J.

Please, send me full information about Royle Strainers.

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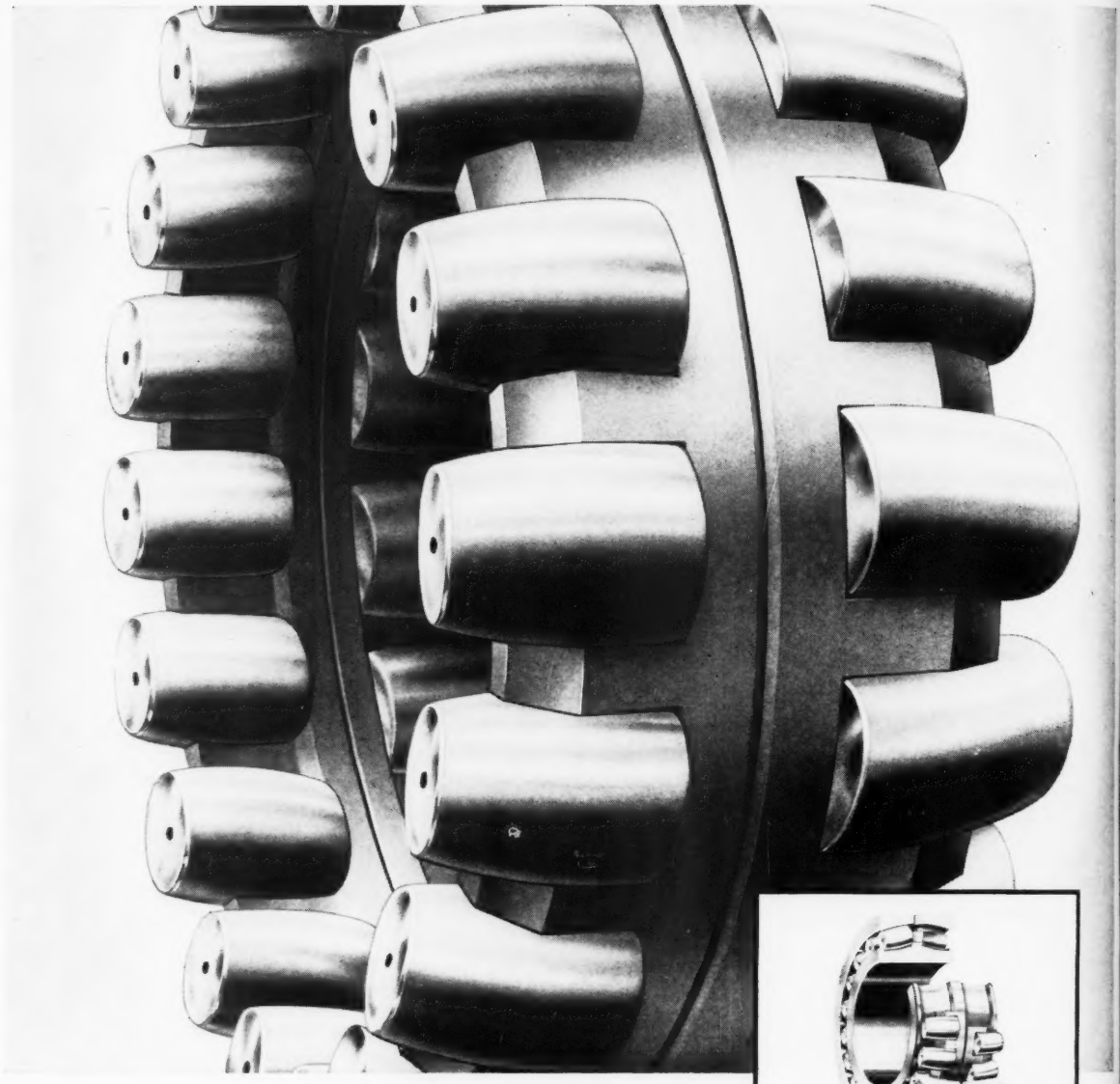
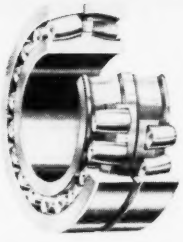
Company_____

Street_____

City_____ Zone_____ State_____





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- integral guide flange for roller stability
- asymmetrical rollers seek flange for positive guidance
- electronically matched rollers
- size-stabilized races
- fully machined land-riding bronze cages
- controlled internal clearances
- even load distribution
- inherent self-alignment
- long service life

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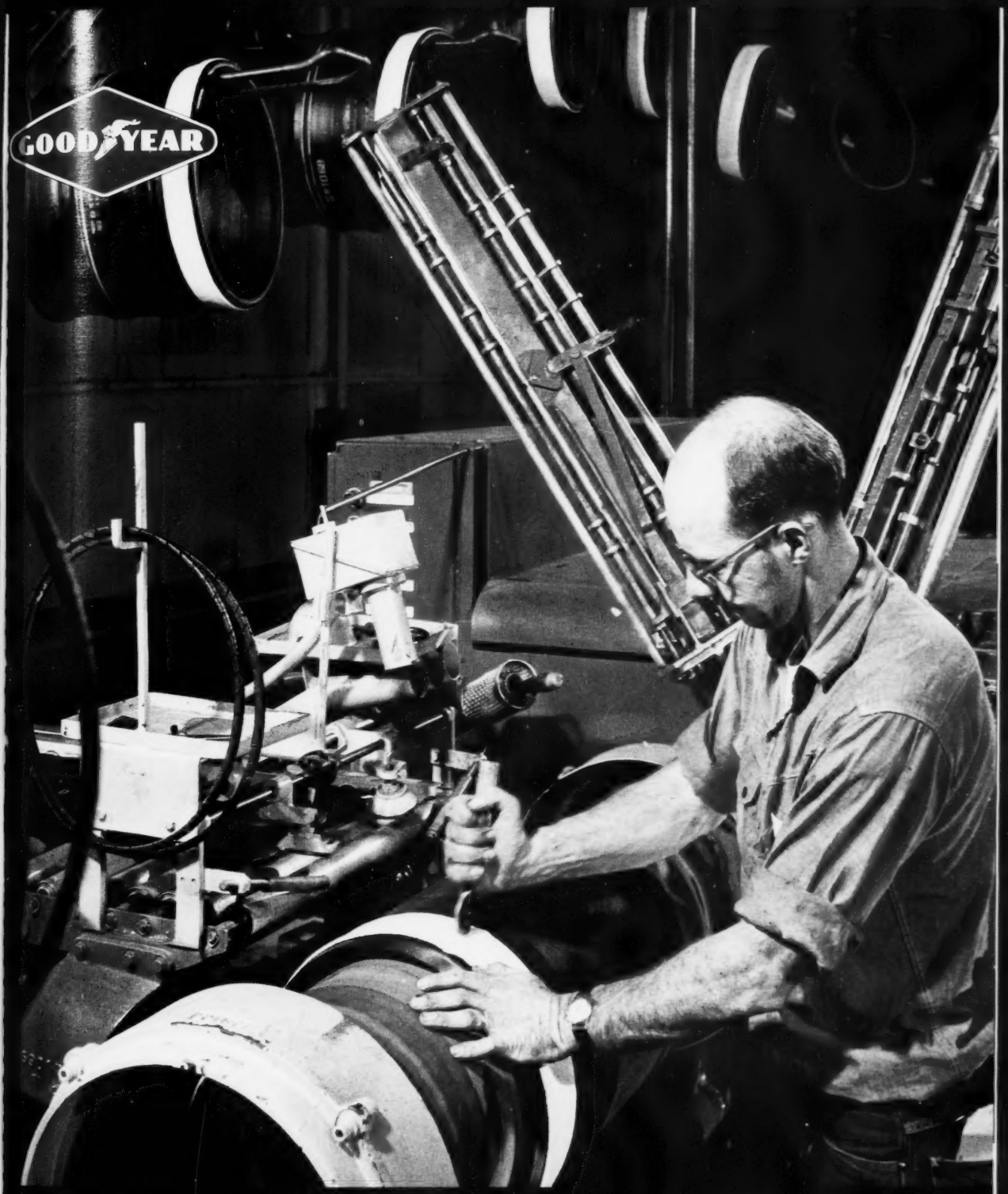

THIS TIRE WILL BE PERSISTENTLY PROTECTED AGAINST O_2 AND O_3

BECAUSE IT'S COMPOUNDED WITH WING-STAY 100

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CHEMICAL DIVISION

Here's why WING-STAY 100pe

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1. WING-STAY 100 is slowly consumed by oxygen! **2. WI**
Many antioxidants or antiozonants prote A nu
against oxygen, but are rapidly consumed in t ited
process. Result: Little or no protection agai migra
ozone remains. WING-STAY 100 is consumed on volati
slowly . . . its effective resistance remains longe patibl
to provide maximum ozone protection. tectiv

Look at this proof of the persisten pr

STATIC WEATHERING TEST:
Samples pre-aged in O_3 bomb for 96 hours @ 158°F. and 300 psi. Then statically exposed on roof for 18 days @ 15% elongation.

DYNAMIC WEATHERING TEST:
Samples pre-aged in O_3 bomb for 96 hours @ 158°F. and 300 psi. Then flexed on rooftop machine for 18 days @ 15% elongation.

Then add these advantages of WING-S

Lots of good things come from

GOOD

100 persistently protects against O_2 and O_3:

by oxygen. nts prote umed in t tion again nsumed on nains long n.

2. WING-STAY 100 is more compatible with rubber—A number of antioxidant/antiozonants have limited compatibility with rubber. Result: They migrate rapidly to the surface and are lost by volatilization. WING-STAY 100 is much more compatible—provides a highly desirable, highly protective light "bloom."

3. WING-STAY 100 is less volatile—WING-STAY 100 is inherently low in volatility. Result: In contrast to the excessive "bloom" of many competitive materials, which quickly disappears, the light "bloom" of WING-STAY 100 resists volatilization by the heat and air flow of a moving tire—persists in its protection.

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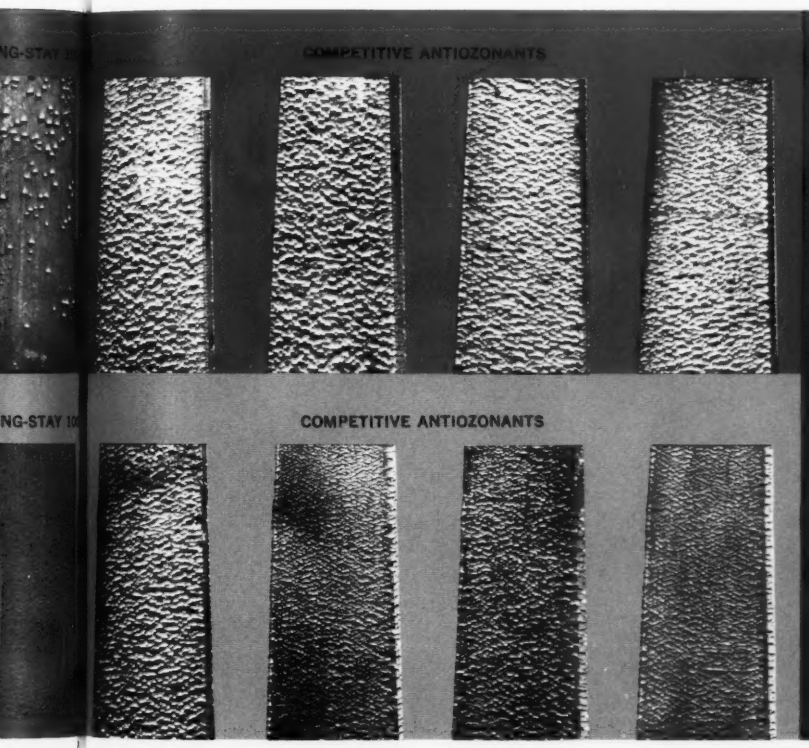

FORMULA FOR TEST SAMPLES—DYNAMIC AND STATIC WEATHERING

PLIOFLEX 1500	100.00 parts
Zinc Oxide	3.00 "
Stearic Acid	1.50 "
HAF Black	50.00 "
145 M.P. Paraffin	0.50 "
Asphaltic Softener	10.00 "
Sulfur	1.75 "
Altax	1.25 "
DPG	0.40 "
plus	
WING-STAY 100	2.00 "

(or equivalent cost volume of competitive antiozonant)

NG-STAY 100:

1. WORKS EFFECTIVELY AS STABILIZER, ANTIOXIDANT AND ANTIOZONANT
2. INCORPORATES EASILY
3. DOES NOT ACCELERATE CURE

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GOODYEAR

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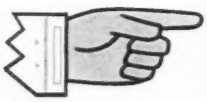
2. ALREADY INCORPORATED—*at no extra cost*—in PLIOFLEX 1500C (cold, nonextended, staining SBR), PLIOFLEX 1710C (cold, staining SBR, extended with 37½ parts of aromatic oil), PLIOFLEX 1712C (cold, staining SBR, extended with 37½ parts highly aromatic oil), and PLIOFLEX 1714C (cold, staining SBR, extended with 50 parts highly aromatic oil)—to serve as better stabilization building blocks.



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Akron, Ohio—14,000 miles

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vs.
Tire containing equal parts of competitive antioxidant

Lots of good things come from

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☐ Please send test samples of X-30 and GD-5-28.
☐ Please have a salesman call. ☐ Please send technical data.

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City_____ Zone_____ State_____

As the technology of an industry extends to new and more complex strata, the simplicity of product origination, purpose and progress is sometimes obscured. Putting a product in perspective can be a refresher for the experts and an historical guide for the newer members of the rubber and carbon black industries.

DR. ISAAC DROGIN
A 39 Year Student of Carbon Black
United Carbon Company

A Product in Perspective

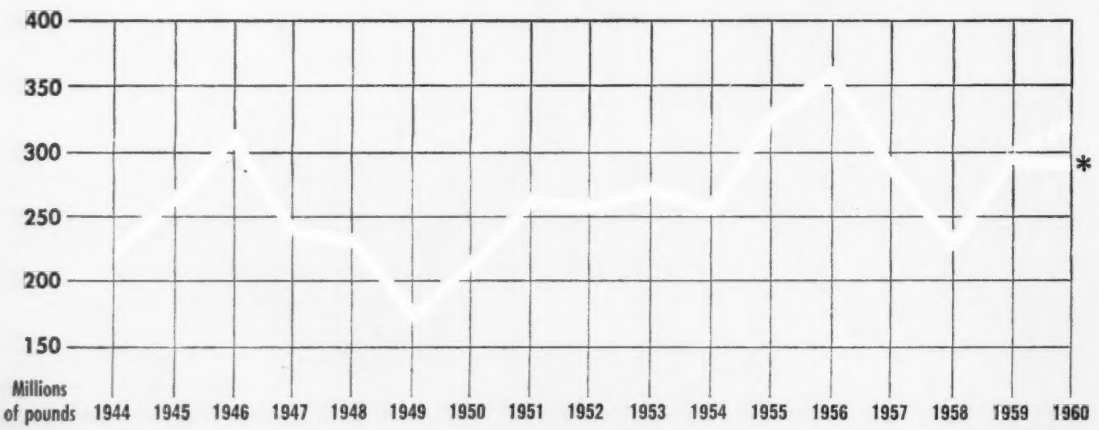
SRF Carbon Black

SRF carbon black or Semi-Reinforcing Furnace black produced from natural gas, oil-enriched gas or oil alone survives today—some thirty-eight years after its introduction—because its functional performance has not been duplicated or exceeded by any other material. Taking this glib phrase apart from the viewpoint of the purchasing agent, the production superintendent, the compounder and the ultimate user, the nature and purpose of SRF can be brought into focus.

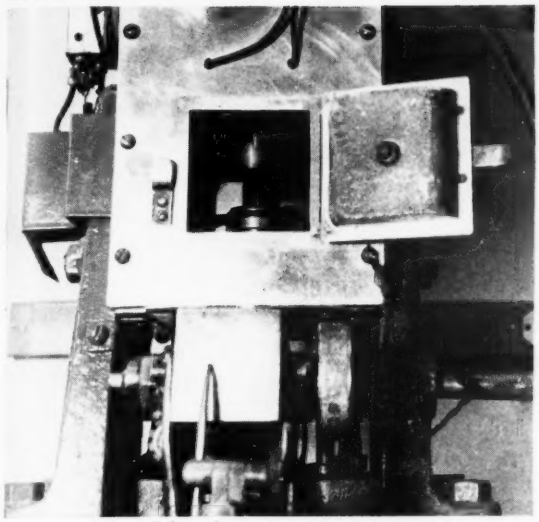
The Search

As in so many industries, the forces which brought about the development of the first furnace black—now designated as SRF—were twofold: property and productivity impasses. This simple statement of fact is found in an early patent covering a furnace process. "The principal object . . . is to obtain a largely increased yield of good quality black from a given amount of hydrocarbons."

The commercial yield of the largest black production technique in use at the time, the channel process, was about 4-6 per cent of the available carbon in the gas. The products produced by the channel process can be characterized as small in particle size, capable of imparting excellent rubber physical properties and exhibiting very high color values. Supplies of low



Sources: Bureau of Mines, U.S. DEPT. OF THE INTERIOR; NGPA.
*11-month actual; 12-month estimated for 1960.



Taking heat generation measurements on an SRF rubber compound.

price natural gas were suspect and the handwriting was on the wall—increase the yield or lose out on the economy front.

Early Results

Thermal blacks were the first results of the industry's research efforts. Here the yield was increased to approximately 25 per cent. On the other hand, particle size was also increased to fifteen times the size of channel black and the color value of thermal black was only 25 to 35 per cent on a comparative basis. (Color or tint values are included in these characterizations of SRF because they were, and still are, good general indicators of the type of reinforcement that can be expected from a product. Early patents usually included reference to this property.)

In 1922, a patent application by Chauncey Matlock introduced the continuous combustion furnace process. In 1933, General Atlas Carbon Company received a patent for a more refined process that resulted in an established commercial product. Yield was 25 to 35 per cent of available carbon; and color value, while not as strong as that of channel black, was 45 to 60 per cent, which is considerably higher than that of thermal black.

Other Plus Features

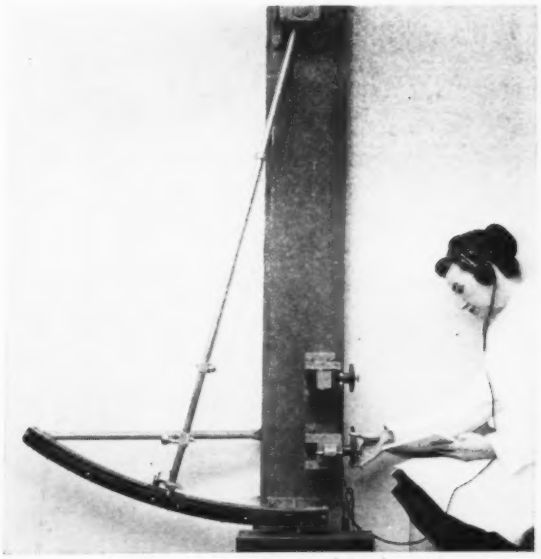
From a manufacturing cost standpoint several improvements were also accomplished by the development of thermal and furnace black production systems. Both systems required less equipment and less plant area; reduced air pollution; lowered maintenance; and provided greater production quality control. This control was possible because the channel process is open or exposed whereas the newer furnace processes are completely closed.

Significant Properties

The significant property differences between channel, furnace and thermal blacks were to allow even broader market and application diversification for black. To visualize this situation, it would be good to review some of the important functions of carbon black in relation to SRF. Briefly stated they are as follows:

1. Reinforcement (wear and service life)
2. Filler (economy)
3. Processing Aid (mixing and fabrication)

In comparative terms SRF is unmatched as an economical, high loading, and strengthening agent for rubber stocks. Breaking this down for further characterization, it can be noted that SRF allows a compounder to increase his loading of black per pound



Determining the resiliency of an SRF rubber compound.

of rubber and still achieve a medium hard, good flexing stock. Similar loading of channel black would make a non-flexible end product with extremely difficult mixing and processing features. Thermal black on the other hand, with its considerably larger particle size, offers greatly increased flexibility but is severely curtailed in reinforcing attributes. Thus, thermal black must be reduced to applications requiring great flexibility at the sacrifice of reinforcement.

Processing Advantages

From a processing standpoint, the softer and more resilient SRF black mixes coolly and easily with the rubber stock even at high loadings. Therefore, scorch problems are minimized and the addition of curatives at any early stage is practical. Further, in uncured stock, SRF has the necessary green strength for slabbing, for holding the full body during tubing and for minimizing any sagging of the rubber during open heat cures.

SRF carbon black has found use in every type of man-made and natural rubber. Its easier mixing and processing has made it especially useful in the nitrile, polysulfide and chloroprene rubbers and it undoubtedly will find an important role in the new rubber copolymers and terpolymers.

Product Uniformity and Performance

At least three patented furnace designs are used in the production of SRF black. Properties will tend to vary according to the nature of different feed stocks (gas and/or oil), their ratios, volume of air intake, furnace temperature gradients, cooling and collection and processing techniques, and the furnace design itself.

If you have a particular question relating to SRF or any other carbon black manufactured by United Carbon Company, please write to Dept. RW-2, United Carbon Company, Inc., 410 Park Avenue, New York 22, N. Y.

PROPERTIES OF SRF IN REVIEW

PROPERTIES*	UNITS	MT	SRF	FEF
Surface Area	Sq. M/Gm.	6.6	19.5	39.0
Particle Dia.	Mu	473.0	160.0	80.0
Volatile Matter	%	0.96	0.74	0.91
PH	—	7.4	9.9	9.3
Iodine Number	Mg./Gm.	8.5	21.1	47.0
Tint Comparison	—	100.	240.	308.

**Property values are based on United Carbon and/or ASTM test procedures.*

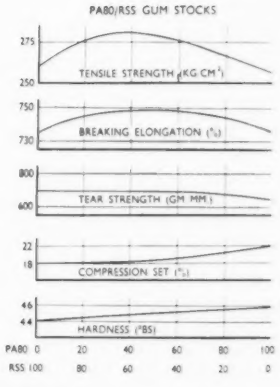
This property chart can illustrate in broad comparisons the difference between MT, SRF and the true carbon black processing aid FEF. Note the tint increase as particle size decreases.

The latest addition to the family

. . . . . is a SPLENDID MIXER

PA 80 RUBBER, latest addition to the family of SP rubbers from Malaya, mixes happily with any grade of natural rubber or with general purpose synthetic rubbers, and what a good influence it is!

How PA 80 maintains quality is shown in the graph for blends with RSS in a pure gum stock. It may be used to meet exacting specifications in extrusion compounds, to control shrinkage of calendered sheet, to firm up very soft stocks, to reduce air trapping in difficult mouldings, etc. If there is a difficult job to do in the factory SP rubber or PA 80 may well be the answer.



For further information on SP rubber and PA 80 just drop us a line.

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PA 80 rubber is produced on far eastern estates under license from the Rubber Research Institute of Malaya and is marketed in the form of 100 lb. blocks wrapped in polythene and packed in multiwall paper bags for ease of handling and good stacking in warehouse and factory.

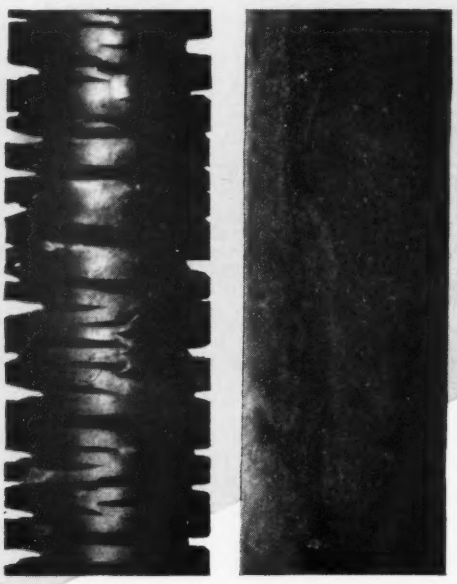
how to vastly increase the useful life of rubber...

Effect of Curing System on Antiozonant Retention in SBR Stocks after Vulcanization

(All contain 3.0 phr UOP 88; 40.0 phr HAF black)

Compound	Accelerator	Sulfur, phr	% Extractable Antiozonant
1082....	2.0 phr benzothiazyl disulfide	2.0	66.4
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1087....	None	2.0	~100.0
1088....	1.0 phr benzothiazyl disulfide	3.0	74.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1089....	1.0 phr benzothiazyl disulfide	1.0	88.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1084....	1.0 phr N-cyclohexyl-2-benzothiazole sulfenamide	—	—
1093....	1.0 phr diphenylguanidine	2.0	~18.0
1085....	2.0 phr tetramethylthiuram disulfide	—	35.0
1090....	4.0 phr tetramethylthiuram disulfide	—	12.9

The SBR specimens below were exposed to ozone at 100°F with 20 percent elongation for 52 hr. at 33 pphm ozone, then 187 hr. at 63 pphm ozone.



Carbon black—HAF (high abrasion furnace), Curing system—4 phr tetramethylthiuram disulfide; Hours to first crack—7 to 23.

Carbon black—HAF (high abrasion furnace), Curing system—2 phr sulfur, 1 phr N-cyclohexyl-2-benzothiazole sulfenamide. No cracks in 239 hr.

CONSIDER THE EFFECT OF YOUR CURING SYSTEM ON THE EFFECTIVENESS OF A CHEMICAL ANTIOZONANT

In compounding rubber, there are several things which are important in assuring maximum crack-free life. First, you must use a potent antiozonant like UOP 88 or 288. Next, consider what a vast difference in effectiveness can be realized by your *curing system.*

The right antiozonant used in correct proportion is of primary importance. Then, by using the proper accelerator, you can promote its maximum effectiveness, and thus contribute to maximum ozone protection.

Look at the two rubber test strips illustrated. Both were formulated with UOP 88 . . . but note how much more effectively the antiozonant worked when accompanied by this change in curing systems—a vast increase in resistance to cracking. The table above the test strips shows how the *proper* accelerator aids antiozonant effectiveness.

Help in achieving maximum effectiveness from UOP 88 or 288 antiozonants in your rubber formulations is available through UOP facilities and technical personnel. Just write or telephone our Products Department.

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

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UNIVERSAL OIL PRODUCTS COMPANY
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UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.

new materials

SBR Latices Marketed

Rubber Corp. of America, Hicksville, N. Y., has added two new grades of SBR latex, 2001 and 2002, to its grade, 2000.

ASTM 2000 is described as high styrene, medium solids, small particle size, and good tack. 2001 is of lower molecular weight to improve adhesion; and 2002 possesses extra light color and medium high solids.

These SBR latices are also being tailor-made to meet specific industrial requirements and are available in different concentrations.

Philprene 1608

Philprene 1608, an SBR black masterbatch containing 52 parts of ISAF, has been introduced by Phillips Chemical Co., Akron, O. The product uses a rosin acid soap emulsion, an acid coagulant, and a staining antioxidant. It is recommended for use in tire treads and high-quality retreads.

Ameripol 4604

Ameripol 4604, a high styrene SBR, has been announced by Goodrich-Gulf Chemicals, Inc., Cleveland, O. The product has a bound styrene content of 40±2%, a Mooney viscosity of 30 to 42. A cold rubber, it is said to have excellent processing characteristics which eliminate the need of peptizing agents.

The rubber is stabilized with a non-staining and non-discoloring antioxidant. It is prepared with a mixed rosin acid and fatty acid soap and coagulated with alum and is recommended for both closed- and open-cell sponge, cements, adhesives, calendered goods, transfer molding, coated fabrics, and hard rubber.

Synpol 8104A

Synpol 8104A, a cold SBR with a non-staining, non-discoloring stabilizer, has been introduced by Texas-U. S. Chemical Co., New York, N. Y. The product, emulsified with fatty acid and coagulated with alum, has a Mooney viscosity of 30 and is recommended for applications that require the most processing ease, including open- and closed-cell sponge products, footwear, and mechanical goods.

Silicone for Potting

Researcher tests cushioning protection provided by LTV-602, flexible potting compound developed by G-E

A clear silicone potting and embedding compound providing mechanical and dielectric protection for electronic components and assemblies has been developed by the silicone products department, General Electric Co., Waterford, N. Y.

The compound, LTV 602, cures at 70-80° C. and is self-supporting and non-flowing. Components embedded in the material can be repaired or replaced by removal of a section of the compound with a sharp instrument, and new material poured into the section and cured without evidence of repair, the company claims.

The manufacturer further declares that because of its low viscosity of 800 to 1500 centipoises in uncured form, LTV-602 will flow freely in and around complicated parts. The material is designed to meet thermal shock requirements of MIL-STD-202A, test condition B, specifying five cycles from 65 to 125° C., and is said to have excellent resistance to both moisture and complete water immersion. Useful temperature range claimed is −65 to 175° C., and cure times 16 hours at 75° C. and 72 hours at room temperature.

Harcure A

Harcure A, a linear polymeric anhydride that functions as a flexibilizer and curing agent for epoxy resins, has been introduced by the Harchem Division, Wallace & Tiernan Co., Belleville, N. J. The manufacturer claims that the product imparts good thermal shock properties and high-temperature electrical properties to cured epoxy recipes. It can be formulated with liquid or solid epoxy resins.

Plioflex 1510

A low-viscosity SBR rubber with what is claimed to be excellent color characteristics has been intro-

(*Continued on page 58*)

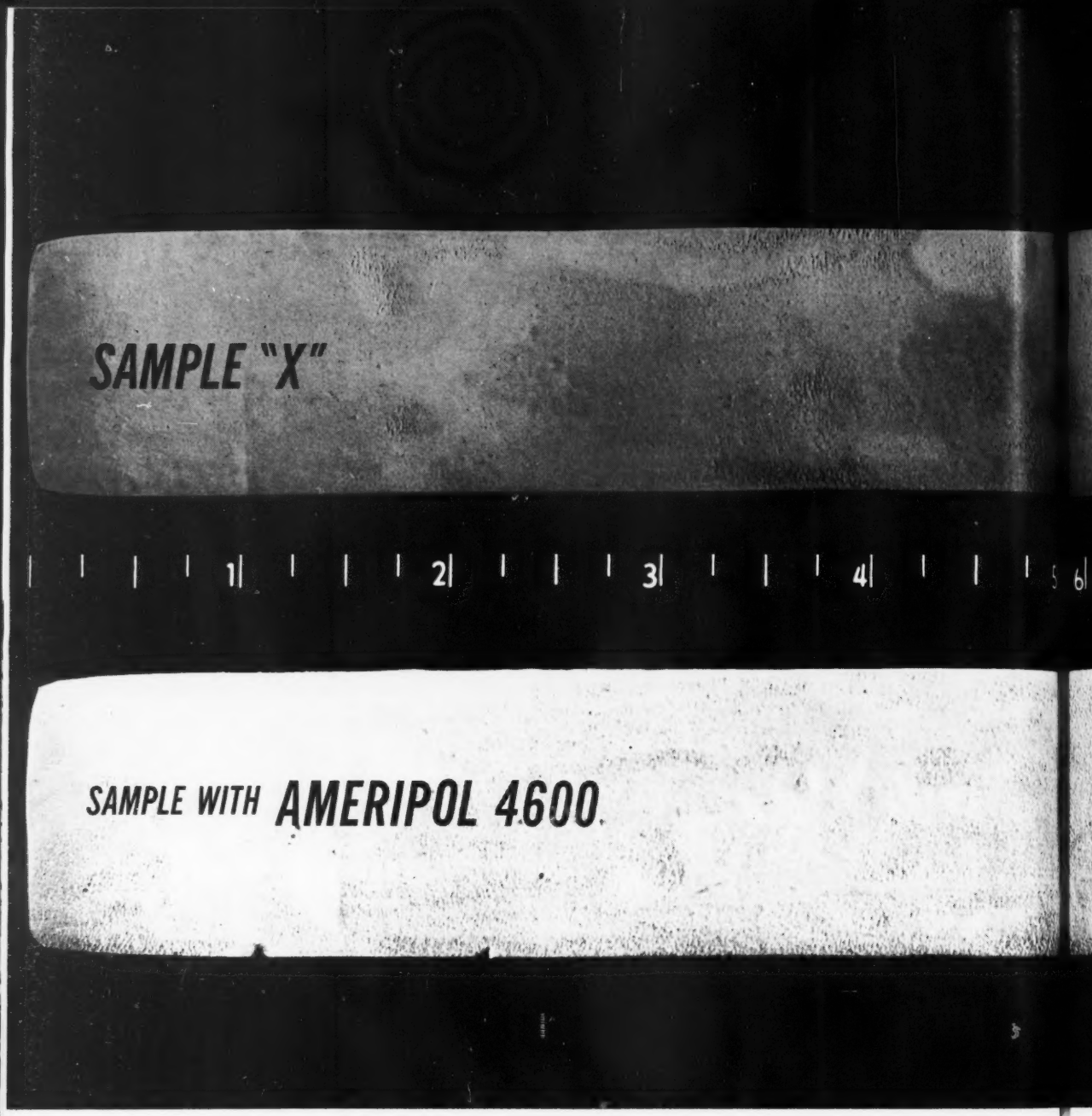
Ameripol Rubber takes to color, like a duck...

The manufacturers of these various rubber products leave color masterbatch compounding to an expert: Disco, Incorporated, of Butler, New Jersey. Disco uses an Ameripol rubber polymer from Goodrich-Gulf since experience has shown its exceptional uniformity, and excellent dispersion characteristics. This simplifies color compounding—and with pigments costing up to 30 dollars a pound, variations can't be tolerated. In addition, Goodrich-Gulf service... in convenient warehousing, dependable delivery, and technical assistance, contributes to an efficient operation. For complete service, come to the world's largest source of synthetic rubber. Goodrich-Gulf Chemicals, Inc., 1717 East 9th Street, Cleveland 14, Ohio.

Ameripol
THE PREFERRED RUBBER

Goodrich-Gulf Chemicals, Inc.

THE ONE TO WATCH FOR NEW DEVELOPMENTS



Ameripol 4600 "Yields" more in sponge recipe...

The test strips above show how the Goodrich-Gulf Technical Service Laboratory was able to help a producer of closed-cell sponge shoe soles improve his product.

The customer sent for evaluation a sample of the stock he was using. This stock was not giving the desired cell structure. Weight and density of the finished article were too high. This material is Sample "X"... a blend of a 1703 type of SBR and natural rubber.

A recommended highly loaded recipe using Ameripol 4600 proved superior, as shown by the samples above. Note the more uniform, open cell structure with Ameripol 4600. And the 4600 sample is larger in dimensions. With reduced density, the "Yield" or volume of sponge stock per pound of raw materials was increased.

These qualitative improvements were realized at a considerable savings. Use of the recipe with 4600

Ameripol
THE PREFERRED RUBBER

COMPARISON OF SAMPLES

	Sample "X"	Sample with Ameripol 4600
Cost per pound	$ .2975	$ .1880
Cost on a pound/volume basis	.1636	.0987
Defo Hardness	3500 gm.	2250 gm.
Per cent recovery	99.4%	97.7%

...has better cell structure, too!

cut cost from 16.3 to 9.8¢ on a pound/volume basis.

These results show the advantages of working with Goodrich-Gulf on your rubber needs. Since we produce the broadest range of SBR polymers, we have a wealth of technical data and know-how to share. And our Technical Service Group is ready to help. Put Goodrich-Gulf to work on your team!

RECIPE USING AMERIPOL 4600

Recipe phr	Parts
Ameripol 4600	100
Goodrite 2007	20
RPA #6	0.5
Zinc oxide	5
Aquarex NS	1.75
Titanium dioxide	10
Hard clay	60
Silene EF	20
Agerite Superlite	2
Aktone	2.9
L. P. Circo Oil	10
Unicel ND	8
Petrolatum	3
Altax	1
Sulfur	3
Total	**247.15**

The stocks (0.25 inch slabs) were cured in a Ross flex mold for 8 minutes at 307°F. (confined), followed by 10 minutes at 307°F. (unconfined), then aged 8 hours at 212°F. in a circulating air oven.

Methods for manufacture of closed cell sponge are covered by various U. S. and foreign patents; these should be checked and necessary licenses obtained before use of such processes.

Goodrich-Gulf Chemicals, Inc.

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Fast—Warehouses in Chicago, Akron, Newark, and Neosho, Missouri, backed by giant plants in Institute, West Virginia and Port Neches, Texas, are geared to give you quick service. Most rubber product manufacturers are within a 24-hour delivery range of Ameripol stocks.

Complete—You have the most complete selection of polymers available: non-pigmented hot, cold, and oil-extended types; micro-black masterbatch cold, and oil-extended types. Packaged in bales to suit your requirements; selected polymers available in crumb form.

Progressive—Extra values with Ameripol include technical assistance, packaging improvements to cut your handling costs, dependable quality to simplify your processing.
And Goodrich-Gulf's polymer development program helps you gain a competitive edge.

Ameripol
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Production people appreciate this pigment's freedom from agglomeration... its non-reactivity with rubber chemicals... its minimal loading requirements. Ask your Cyanamid Pigments representative for further information and free samples.

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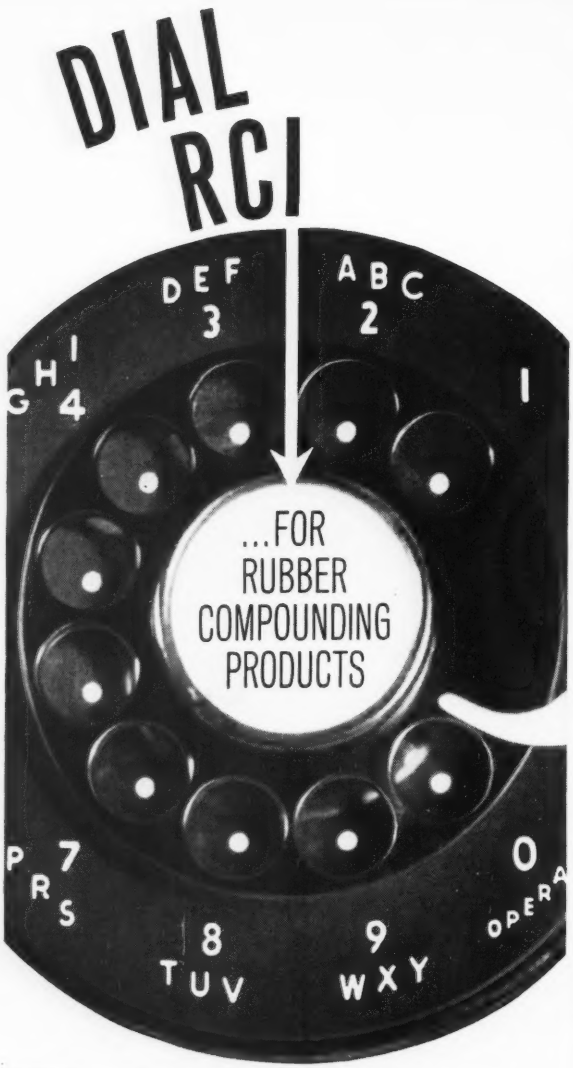

ESTER GUMS All Types. Glycerine and pentaerythritol esters of gum, wood, polymerized wood, hydrogenated wood, dimerized wood and tall oil rosins.

PURE PHENOLIC RESINS Heat Reactive, Novolac Type, Thermoplastic and Terpene. A wide variety of resins intended primarily for tackifying and reinforcing neoprene, acrylonitrile and other synthetic elastomers.

PLASTICIZERS Polymeric and Chemical. A wide range of polymeric and monomeric plasticizers and epoxidized oils for the compounding of neoprenes, nitriles, and other synthetic elastomers.

CHEMICALS Phthalic anhydride, maleic anhydride, pentaerythritol, formaldehyde, methanol, phenol and phenol derivatives.

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REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

new equipment

■

Footage Counter

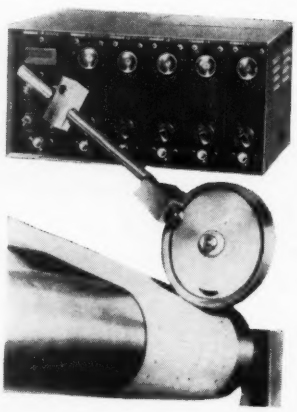

Photo-Electric Footage Counter

Standard Instrument Corp., New York, N. Y., has introduced the Photo - Electric Footage Counter, a lineal measuring device with photoelectric sensor, which is available in models for measurement and control in yards, feet, tenths of feet or inches. Its applications include rubber, paper, cloth, plastics (sheet, rod, and wire), and glass.

The instrument will eliminate load drag inherent in mechanical registers, resulting in greater accuracy, the manufacturer states. Preset counters, capable of operating at high production speeds, will provide instantaneous measuring, counting, and recording operations. Multiple, predetermined settings may be selected as desired for sequential operation. For example, in a 10,000-yard cycle actuated by a multipreset counter, electronic circuits will sound a warning bell at 9,500 yards, and at 9,900 yards, the machine is slowed and then stopped at the 10,000-yard point.

Walco Coater-Spreader

L. R. Wallace & Co., Pasadena, Calif., has introduced a new line of glue spreaders and roller coaters, available in four-inch, five-inch, and six-inch rolls. All models come in single top coater, double coater, and bottom coater models, in lengths ranging from eight to 72 inches.

Remote Air Regulators

Remote regulation of air lines is made possible with a device introduced by Hannifin Co., Des Plaines, Ill. The device, the Hannifin Crown "Pilot Controlled" Regulator, uses a column of controlled pressure air to accomplish the control job.

TIRE FABRIC PROCESSING EQUIPMENT

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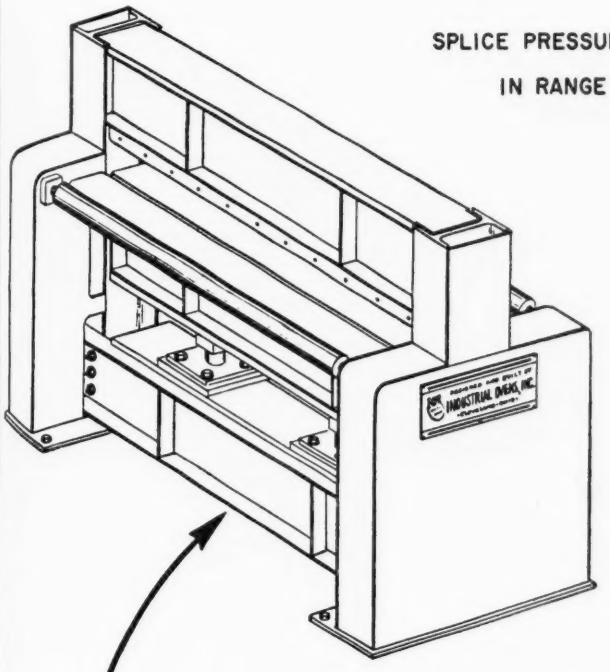
RUGGED, EFFICIENT & EASY TO OPERATE



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IN RANGE OF 50 TO 300 TONS

MAXIMUM DEFLECTION ON PLATEN 0.020"

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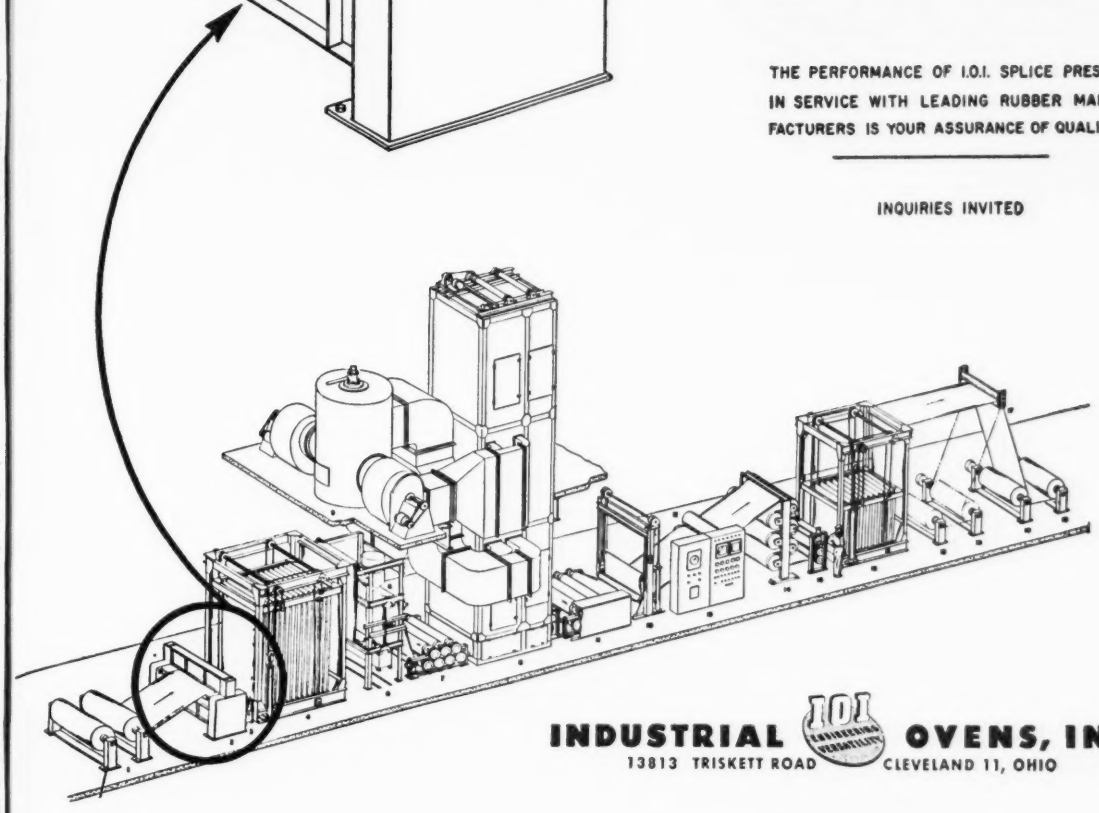

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Further details are easily obtained by writing to:

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new equipment

New Xenon Weather-Ometer

Xenon Arc Weather-Ometer

Atlas Electric Devices Co., Chicago, Ill., has introduced a new line of Xenon Arc Fade-Ometers and Weather-Ometers. The Xenon lamp is said by the company to be a good source of radiation for accelerated fading and weather machines because of a special energy distribution very close to that of natural sunlight.

The lamp employed is a 6,000-watt water-cooled Xenon lamp. The specimen rack will accommodate up to 54 specimens three by nine inches in size. The machines provide automatic control of black panel temperature, cycles, etc., and are also available with automatic control of humidity during both light-on and light-off periods. These machines are available with constant wattage transformers to ensure uniform radiation intensity. Control equipment permits increasing wattage of lamp to compensate for progressive loss of intensity as the lamp ages.

Volumetric Feeder

A volumetric feeder with belt and feed gate design, the Merchen Volumetric, has been introduced by Wallace & Tiernan Inc., Belleville, N. J. The new feeder, which measures all free-flowing powdered, granular, or lumpy solids, has a maximum capacity of 3,600 cubic feet an hour. A smaller model has a capacity of up to 600 cubic feet an hour.

Models are available with 9-inch or 18-inch NBR feed belts. Feed rate is adjustable over a 10:1 range, alterable to a 100:1 range by means of a two-speed gear box, and to a 1000:1 range with a variable-speed drive available on the 9-inch model only.

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Kenflex REG. TRADE MARK RESINS

for

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KENFLEX® — a series of polymers of aromatic hydrocarbons in pumpable liquid, crushed and solid forms, non-volatile, non-migratory, soluble in plasticizers and common solvents except water and lower alcohols

KENFLEX® Resins provide easy processing properties for all stocks. They impart high electricals and moisture resistance. **KENFLEX®** Resins have particular effect in —

NEOPRENE . . . for retarding crystalization.
HYPALON . . . for easy dispersion of litharge.
BUTYL . . . for outstanding ozone resistance.
VINYLS . . . for fast fluxing.
Nitrile and Nitrile-Vinyl Copolymers . . . for fast fluxing, ozone resistance and mold flow.

KENFLEX® and **KENMIX®** are extensively recommended for wire and cable compounding as reported in the published report of the Wire and Cable Symposium, held on September 28–29, 1959, at Wilmington, Del., conducted by the Elastomers Chemicals Department, E. I. du Pont de Nemours & Co., Inc. (Ask for Bulletin 100 A.)

KENMIX® Dispersions eliminate the need for masterbatches. They combine **KENFLEX®** with accelerators (red lead, litharge, etc.) in an easily handled, stiff paste form that simplifies compounding, shortens mixing time, eliminates dust and provides excellent dispersion. **KENMIX®** Dispersions also may be made with the process oil of your choice or any other vehicle you recommend.

KENMIX® Dispersions . . .

- Overcome the hazards of handling heat sensitive materials
- Protect accelerators from moisture and CO_2
- Have a short heat history

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Day Nauta mixer employs a three-way action for rapid dispersions

Orbiting Screw Mixer

The J. H. Day Co., division of the Cleveland Automatic Machine Co., Cincinnati, O., has been granted exclusive license to manufacture and sell the Nauta mixer in the United States and Canada under the Day name. The mixer, produced by NautaMix N. V., Haarlem, The Netherlands, is said to have major applications in processing of latex and other rubber products where fast, highly accurate mixing of batch ingredients is essential.

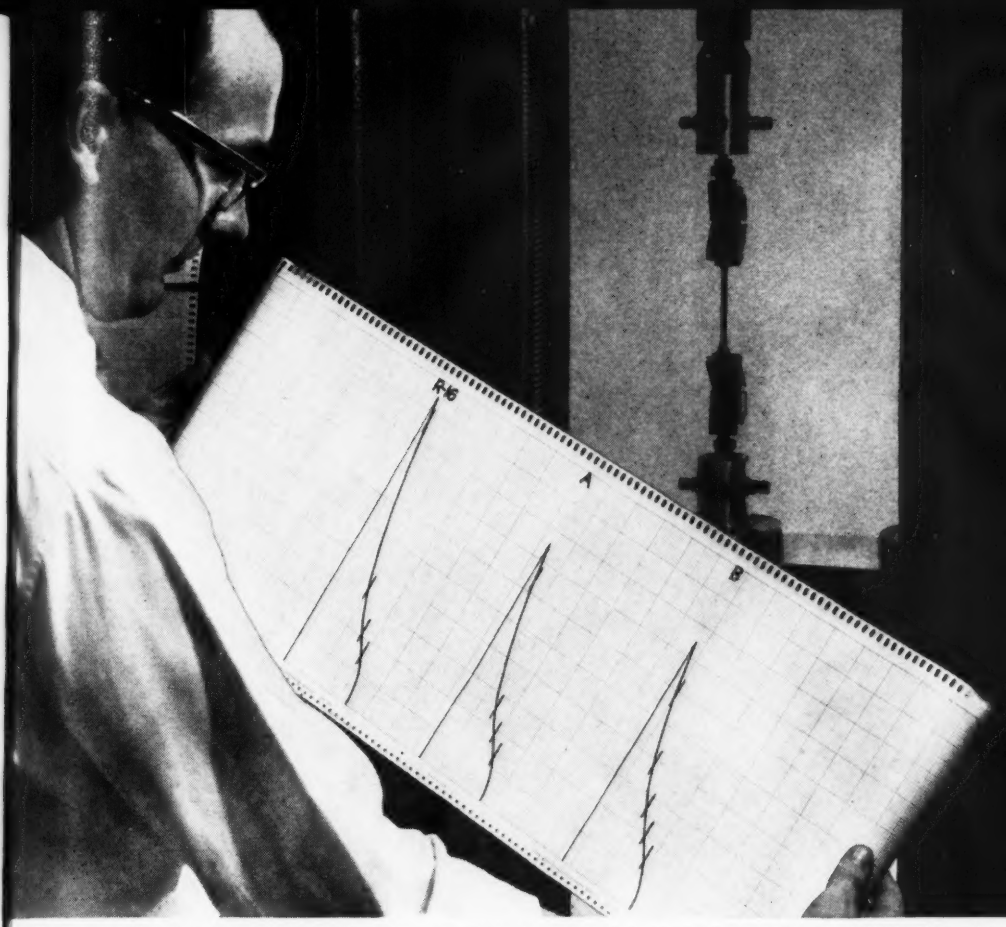
The Day Nauta mixer uses an orbiting screw for a three-way mixing action which is claimed to achieve dispersion faster with a minimum of heat generation.

The mixer consists of a conical container with a rotating screw positioned along its wall. As the screw revolves, it orbits around the wall of the container. The material is spiraled upward by the revolving screw and at the same time moved in a second spiral by the motion of the screw around the container wall. Also simultaneously, the material lifted to the top of the cone flows down its sides, producing a three-way effect. Since the contents of the container remain closely together and are not whirled around, differences in specific gravity of the components and differences in air resistance do not separate components. This means practical elimination of heat from friction and a highly accurate mix.

According to the manufacturer, a 5-hp. motor can mix a 4,000-pound batch, and the machine starts under full load. The continuous cone shape of the container eliminates corners and makes the machine easy to clean and maintain.

The Day Nauta mixer is available in a variety of sizes from a ½-gallon laboratory-size model to full production sizes with capacities of up to 925 gallons. A number of discharge valve types is available, and the mixer can be adapted for floor, wall, ceiling, and other mounting arrangements.

For batches to which precise quantities of liquids are to be added during the mixing cycle, the Day



Dr. Stanley Jankowski, one of Neville's senior chemists, is shown here holding a test chart showing the results of tensile testing three aged rubber samples. The chart is just as it came from the Instron Tester, except that scribe lines have been inked over and labeled for visability in the picture. They have not been changed. From left to right, samples contained Neville's R-16 Coumarone-Indene Resin, competitive resin A and competitive resin B. Detailed results are shown below.

Competitive tensile test shows Neville Resin superior

Neville's R-16 Coumarone-Indene Resin was matched against two other leading resins in a neutral colored SBR test recipe compounded for comparative analysis. The results were as follows:

	Average Tensile	Aged Average Tensile	% Tensile Retention
Neville's R-16	1830 psi	1400 psi	76.5
Competitor A	1680 psi	1150 psi	68.5
Competitor B	1655 psi	1275 psi	77.2

Beyond superior tensile strength, there are other benefits derived from compounding rubber with R-16 Neville Resin. Elongation, both before and after aging, is exceptional and considerable aid to processing is enjoyed. Better mold flow and easier dispersion of fillers are also realized in using R-16 Neville Resin. Use the coupon to write for further information.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Styrenated, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50-W Hi-Flash*, Wire Enamel Thinners, Nevsolv* • **High Purity Indene.**

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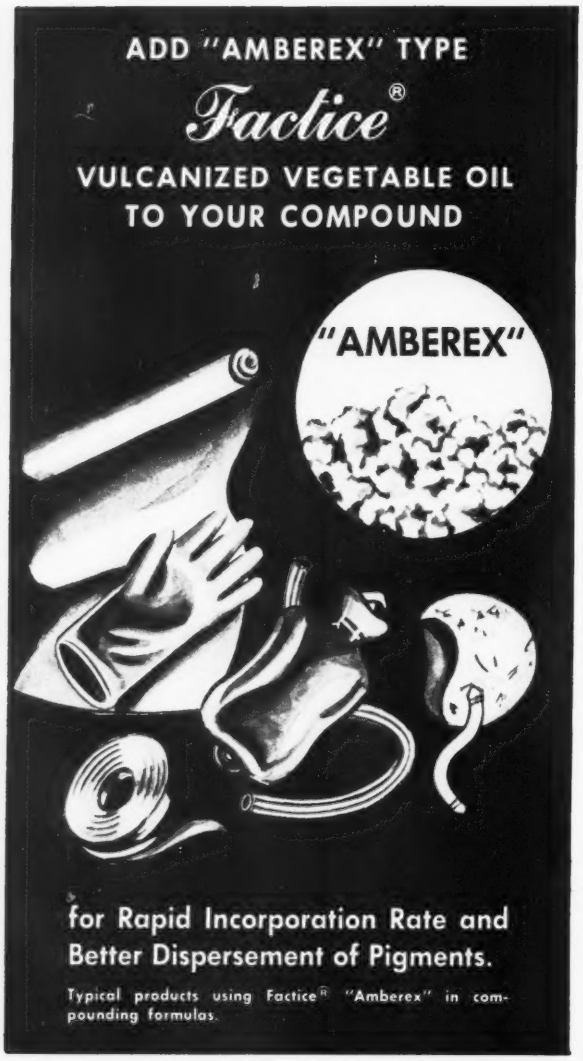


The Amberex type of Factice® is made from various kinds of vegetable oils and in various degrees of polymerization. All are light colored, transparent, free from chlorine and have practically no ash.

There are six different Amberex types, each having properties for specific applications. The selection of the proper Factice® for a compound is important. Send us your formula for our suggestions. All formulas held in strict confidence. Our trained staff will help in selecting the proper vulcanized vegetable oil for your need . . . Factice®, White, Brown, Neophax or Amberex.

Factice Vulcanized Oil — THE STAMFORD RUBBER SUPPLY CO.

THE STAMFORD RUBBER SUPPLY CO.
STAMFORD, CONN.

new equipment

Nauta Microject injecting device may be used. Additions are made at the lower end of the cone where mixing actions converge, and the injector is said to add even difficult liquids such as water, fats, and oils to large amounts of dry materials without lump formation.

Murphy Aftercooler

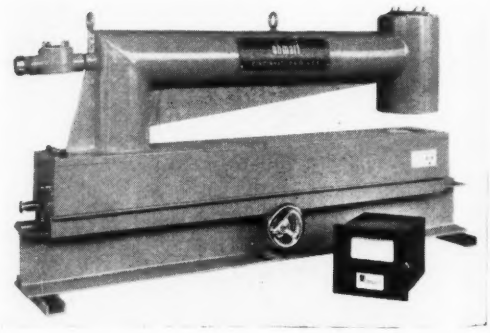
The Murphy A4VC Aftercooler, designed to cool and dry compressed air, has been introduced by James A. Murphy & Co., Hamilton, O. This aftercooler is built for capacities of 50 to 120 cubic feet of free air per minute, with a cooling chamber 4½ inches in diameter. The manufacturer guarantees that the water-cooled unit will cool air to within 85% of the cooling water temperature.

New Thickness Gage

Ohmart Corp. has introduced a new beta radiation nuclear gage for measuring thickness variations in sheet materials during processing. This new gage is the first to feature a miniaturized transistor power supply indicator, replacing vacuum tubes. The new gage is also said to take up less space, require less maintenance, and cost considerably less than the older types.

This gage uses two different radiation sources in three different models. Krypton-85, with a half life of 10 years and beta energy of 0.695 mev., is the source for very thin materials; and Strontium-90, with a half life of 28 years and energy of 2.18 mev., is used for thicker materials.

The new gage uses the Ohmart cell for converting radiation to electrical current. The beta source is placed on one side of the material, and the Ohmart cell on the other. As thickness of the material varies, the amount of electrical current changes. Output is fed to potentiometric recorder controllers for a continuous record of thickness variation and automatic control of the system. Automatic traverse can be programmed to specific user requirements.



Beta radiation thickness gage

(Continued on page 44)

PHILLIPS 66

Now On Stream

CIS-4*

STABLE SUPPLY OF
SYNTHETIC POLYBUTADIENE
RUBBER... DRAMATICALLY
IMPROVES TIRE PERFORMANCE

FOR TEST RESULTS
SEE BACK OF THIS PAGE

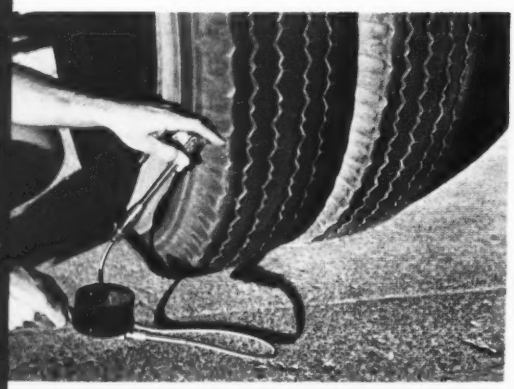
UNIFORMITY
HEAT BUILD-UP
RESILIENCE
ABRASION RESISTA
DIAL CIS-4
for performance facts in
truck tire tread compounds
you can depe
on the uniform
quality of CIS-

CIS-4*

A PRODUCT OF PHILLIPS CHEMICAL COMPANY, AKRON, OHIO

*A trademark

CIS-4 proved in over 3 million miles of road tests



Grueling road tests . . . in all kinds of weather . . . totaling well over 3 million tire miles prove Cis-4 to be the most exciting synthetic discovery since cold rubber. Road tests showed 20% more mileage for tire treads made of 60% Cis-4 and 40% natural rubber, compared to all-natural tire treads. This same Cis-4/natural blend gave 23% less heat build-up than SBR-1500 compounds . . . and was equal to natural in this respect. Get up-to-date facts on Cis-4, and ways it will help you make better tires—or other rubber products. Write, wire or phone.

PHILLIPS CHEMICAL COMPANY

Rubber Chemicals Sales Division

318 WATER STREET, AKRON 8, OHIO

PHILLIPS 66

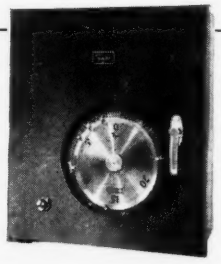
IMPROVED

"ROBOT BRAIN"

works faster, more precisely!

Taylor FLEX-O-TIMER® Controller gives:

- *Up to 12 pneumatic and/or electric functions*
- *Faster, easier setting of Program Trip Pins*
- *Positive acting air valves with more than 3 times previous output capacity*



Recognized for many years as a highly versatile "robot brain" for the precise timing and coordination of batch processes, this new FLEX-O-TIMER Timed Program Controller has been made even more simple to operate, more precise in its control. It is ideal for providing completely automatic time control for tire presses, particularly for nylon cord tires requiring additional functions; platen presses; or any process requiring precise timing of process sequence and duration involving temperature, pressure, mechanical motion, electrical energy, or any combination thereof.

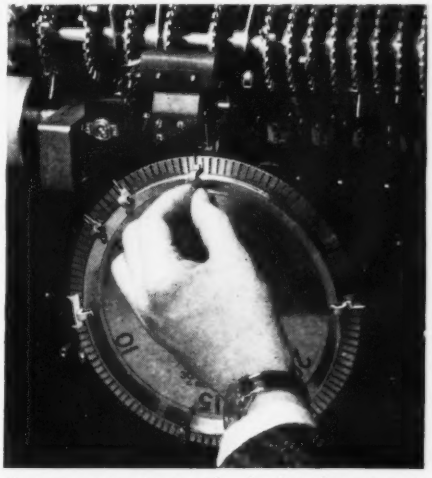
As well as the three major improvements listed above, the new FLEX-O-TIMER Controller incorporates these plus features:

- Extremely short time intervals between steps (with high accuracy) can be accommodated . . . 7½ seconds on 30 minute cycle dial; minimums on other dials in same ratio.
- Cycle range is quickly adjustable for 15 to 60 minutes for highspeed range. 1 to 16 hours for low-speed range.
- Time dial automatically resets to zero in maximum of 13 seconds at completion of cycle.

* * *

Ask your Taylor Field Engineer for full details or write for **Bulletin 98373.**
Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ont.

The 350R Series FLEX-O-TIMER Timed Program Controlled actuates switches, valves, performs other operations at the proper time and in proper sequence.



Program Trip Pins are simply placed at selected intervals, set screws tightened with an Allen wrench.

Step Cams fit snugly into step disc notches, are easily bolted into place, never have to be adjusted.

Taylor Instruments **MEAN ACCURACY FIRST**

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Division of Rubber Chemistry
A.C.S. Convention
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CARBON BLACK WHEN YOU WANT IT

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THE NETHERLANDS

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Whatever the clock may say...wherever you may be...a Witco-Continental Sales Office is ready to take care of your carbon black needs. Witco-Continental's plants are operated on a **continuous** production basis to assure you of quality carbon black in all grades whenever you need it.

The moment you contact a Witco-Continental representative, a "Unified Control" system goes to work for you. Your requests are channeled through one integrated world organization to give you the product or service you need... backed up by advanced research and production facilities...in the shortest possible time.

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Excellent aging characteristics with both natural and synthetic rubbers.

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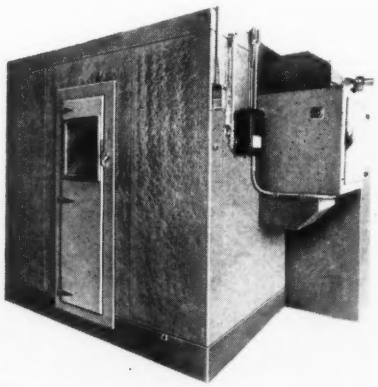
MAPICO IRON OXIDES UNIT

COLUMBIAN CARBON COMPANY
380 Madison Ave., New York 17, N Y.

new equipment

(Continued from page 34)



Controlled temperature laboratory room

New Conditioning Room

Testing Machines, Inc., Mineola, L. I., N. Y., has introduced the Model TMI-100-1 "Uni-Lab," a laboratory room said to be capable of producing and maintaining controlled temperature and humidity within the standard range of 70 to 80° F. dry bulb temperature and 40 to 75% relative humidity, or with relative humidity range up to 90% and dry bulb temperature up to 120° F.

The room, which meets or exceeds present ASTM and TAPPI standards for conditioning paper, board, plastics, rubber, and similar products, according to the manufacturer, is fully insulated, with the necessary air movers, cooling and heating coils, humidifying apparatus, and associated electrical and control equipment.

It is available in various dimensions, according to the manufacturer, although the standard size has an interior seven feet high and six feet square.

New Nuclear Gages

A new line of nuclear gages for non-contacting thickness-density measurement and process control has been announced by Radionics Inc., Norristown, Pa.

The basic gaging unit, called a MicroMeter, differs from beta gages now on the market in that it utilizes a highly specialized technique of scintillation detection developed by the company. The detector permits the use of either beta or gamma radiation, extending the range of application from the thinnest tissue paper to a foot of steel or more.

The high speed of response—down to 10 milliseconds—permits extremely high-speed inspections. For example, with material moving 5,000 feet per minute, thickness change indication can be given before the material has moved one foot.

Applications are not limited to thickness-density measurement and control. The detector shape can

(Continued on page 48)

HOBBS CENTER-SHAFT
WEB WINDING & UNWINDING DRIVES

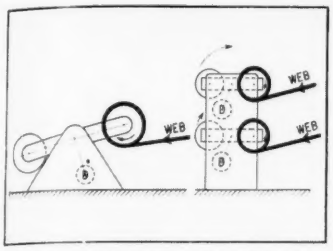


Fig. 1 — Diagram illustrating layout of two-shaft and four-shaft turret winders

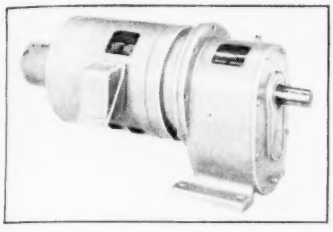


Fig. 2 — Hobbs Standard CHP Winding Drive

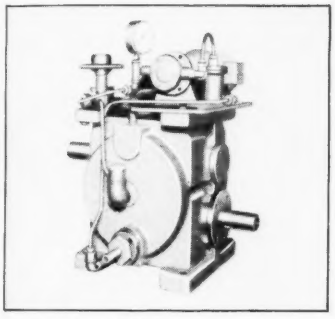


Fig. 3 — Hobbs APF Progressive Friction Winding Drive

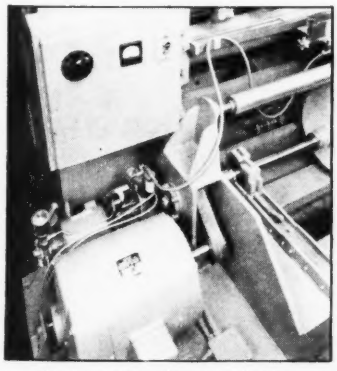


Fig. 4 — Hobbs HG Unwind Drive

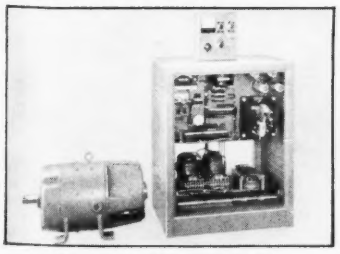


Fig. 5 — Hobbs Vers-A-Wind Drive with Control Panel

872-0

9 Types from which to Choose

Hobbs Center-Shaft Winding (see Fig. 1) is superior to surface drive winding, because it makes it possible to wind and to control tension, without friction on the surface of the material. Thus the possibility of abrasion or distortion is avoided and a roll with maximum usability or salability is assured. The various types of Hobbs drives for web winders and unwinders and their adaptability are described herewith.

HOBBS STANDARD CHP WINDING DRIVE (Fig. 2)

Preset tension is automatically maintained through the torque-speed characteristic of a constant horsepower A. C. motor. The latter slows down as the diameter of the roll increases. Its torque output increases proportionally, maintaining essentially constant H. P. — the equivalent to constant tension. May be stalled 100%. Also supplied for tapered tension. Ratio of speed change and diameter buildup as high as 1:30.

HOBBS NTJ WINDING DRIVE WITH SYNCHRONIZATION

Preset tension maintained during frequent speed changes through a 3-phase synchronizing generator, driven by main machine. Speed of generator varies with that of main machine. Frequency of output current and speed of motor varies accordingly, resulting in essentially constant tension. Unit has higher ratio of speed change and diameter buildup than standard unit, a ratio of 1:100 being obtained on some material.

Typical applications of the CHP and NTJ include calendering, coating, embossing, flexographic printing, inspecting, laminating, plastics.

HOBBS APF PROGRESSIVE FRICTION WINDING DRIVE (Fig. 3)

Preset tension automatically maintained with extreme accuracy, during a roll buildup of 8:1, through a series of overriding friction clutches running in oil. Driven from the main machine, winder changes speed in proportion and still maintains constant tension. Required torque increase is sensed directly from the web. For use with calenders, coaters, dampening machines, laminators, slitters and waxers.

HOBBS HG UNWIND DRIVE WITHOUT SYNCHRONIZATION (Fig. 4)

Tension is maintained through the torque-speed characteristic of the unit, which closely approaches constant horsepower. As the diameter of the roll decreases, the r.p.m. increases and the braking torque decreases. Hence the tension on the material remains essentially constant. Tension is adjusted by controlling the current. Used where process speeds are constant and where the unwind roll is up to speed before the HG Unwind is energized.

HOBBS HG UNWIND DRIVE WITH SYNCHRONIZATION

Designed for applications requiring stop-start and speed changes during operation. Eliminates need for manual control. A saturable reactor with necessary bias and signal control is used for synchronization. A tach generator, driven from the process machine, generates current for the reactor, which increases as the speed increases. From zero to full speed, the supply current is controlled from near zero to almost full. Once tension is set by a control knob, no further adjustment is required.

Hobbs HG Unwind Drives are used with coaters, dampeners, laminators, printing presses, friction calenders, slitters, etc.

OTHER DRIVES INCLUDE...

— Hobbs DCS Vers-a-wind Speed Control Drive (Fig. 5), Hobbs DCT Vers-a-wind Tension Control Drive, Hobbs DCTA Vers-a-wind Tension Control Drive and Hobbs DCTS Vers-a-wind Tension Control Drive. Description on request.

AIR AND MECHANICAL BRAKES

For unwind applications, alternate air or mechanical brakes can be furnished for automatic or manual control of unwind tension.

WINDING ACCESSORIES INCLUDE...

— web guides, castered bases, mandrels, "Center-Loc" core holders, conventional core chucks, special core chucks, and slitting attachments.

ALSO COMPLETE WINDING MACHINES, INCLUDING...

— light, medium and heavy duty single shaft; medium and heavy duty two-shaft staggered; medium and heavy duty three-shaft staggered; medium duty four-shaft staggered; two-shaft cantilevered fixed shaft and turret; light, medium and heavy duty two-shaft turret; heavy duty two-station shaftless turret; light and medium duty four-shaft duplex turret, and heavy duty three-shaft turret. Type of winding drive used is selected on basis of process specifications and application.

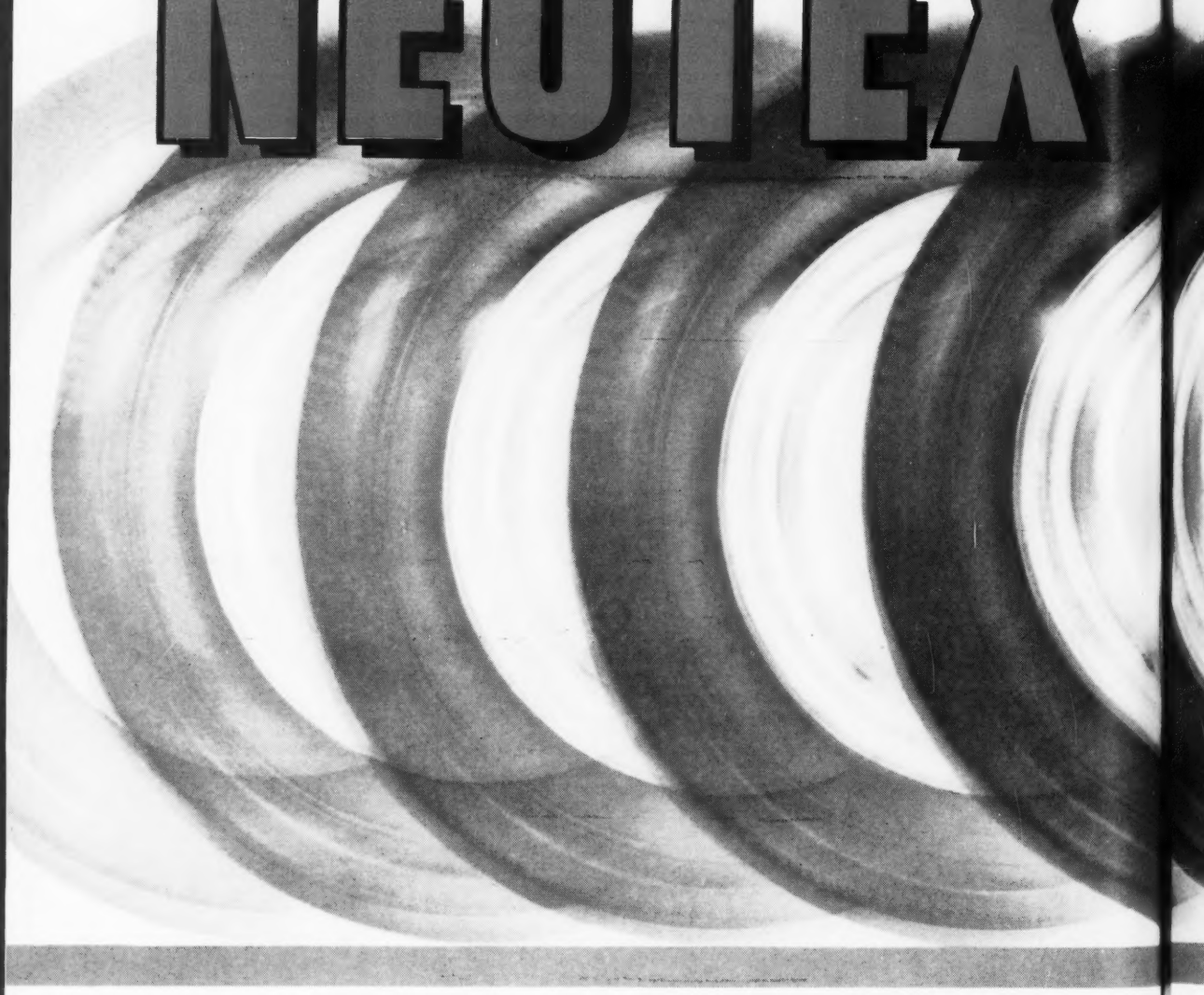
LITERATURE • The complete line of Hobbs Center-Shaft Web Winding and Unwinding Drives and Hobbs Winding Machines is described and illustrated in "Principles and Practices of Modern Winding". Send for a copy free of all obligations.

HOBBS MANUFACTURING COMPANY
60B Salisbury Street, Worcester 5, Mass.

Direct Sales Offices in Irvington, N. J., Columbus, O., Chicago, Ill., and Los Angeles, Calif.
Representatives in Greenville, S. C., and Toronto, Ont., Canada

WINDERS • HAND & POWER SHEARS • SLITTERS • AUTOMATIC CUTTERS • DIE PRESSES

NEOTEX®



Industry asked for a softer ride

NEOTEX 100

...in the HAF fineness range...develops low modulus...for use in carcass stocks, natural rubber treads, high grade mechanicals, etc. Now being used as a Channel replacement.

NEOTEX 130

...in the ISAF range...develops low modulus, good tensiles, high elongation and lower Shore Hardness . . . for improved ride in passenger tires.

NEOTEX 150

...in the SAF range . . . produces highest tensiles of any rubber carbon . . . gives best ride-noise-tread wear combination . . . tailor-made for the Black Rubber process.

B-2

COLUMBIAN CARBON COMPANY

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idless noise . . . good wear:

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Once again, with the development of the NEOTEX series, Columbian has led the way for finer-quality products, both in tires and industrial rubber goods. Through NEOTEX, the compounder can get oil furnace blacks that provide high tensile, low modulus and low hardness. And now, with the *immediate availability* of NEOTEX, you have the quality carbon black you asked for: good wear, less noise, softer ride. Contact your Columbian representative . . . and send off the coupon for the whole story . . . *today*!

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Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

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Represented by
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Akron, Boston, Chicago, Pico Rivera (Cal.), Trenton, Albertville, (Ala.), Denver, Greenville, S.C.

new equipment

(Continued from page 44)

be adapted to flaw detection in thick sections—in hot steel blooms, non-ferrous billets, and solid propellent rocket engines. Liquid levels can usually be indicated to within 1% of the range being measured. The MicroMeter can also be used in dimension gaging, as in the width and or weights of hot steel slabs, the weighing of small parts, etc.

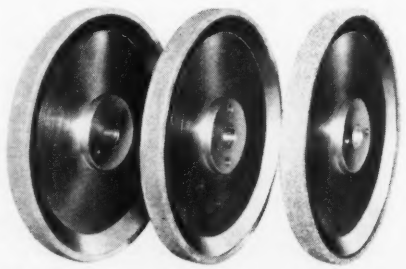
Motor Mount Tester

A motor mount tester designed to test the dynamic spring rate and resiliency of rubber mounts, the Model 652-2, has been introduced by Mast Development Co., Davenport, Iowa.

The tester consists of a horizontal beam pivoted at one end, an electrical vibration exciter attached to the free end of the beam, and a fixture assembly which grips the rubber sample so that the sample supports the weight of the beam. A low-frequency oscillator amplifier drives the armature of the vibration exciter so that a maximum of 10 pounds of alternating force is available at the beam end. An electronic counter is used to measure the period of oscillation of the signal generated by the oscillator. The results of the test are transmitted by strain gage instruments to an oscilloscope where the test results are displayed.

The tester has a maximum vibrating force of 10 pounds and a static preloading range of 50 to 300 pounds. The range of rubber sample amplitude of oscillation is 0 to 0.100-inch, and accuracy of control is ± 0.0005-inch. A larger model, 652-3, has a maximum vibrating force of 25 pounds and static preloading range of 10 to 500 pounds.

Tungsten carbide-coated abrasive wheels have been introduced by Burgess-Norton Mfg. Co., Geneva, Ill., for such rubber goods finishing applications as tire finishing and roll grinding, flash cut-off, and trimming. The company says the new wheels, trade marked "Tunco," will perform some operations in a seventh of the time which was previously required with six times as long tool life



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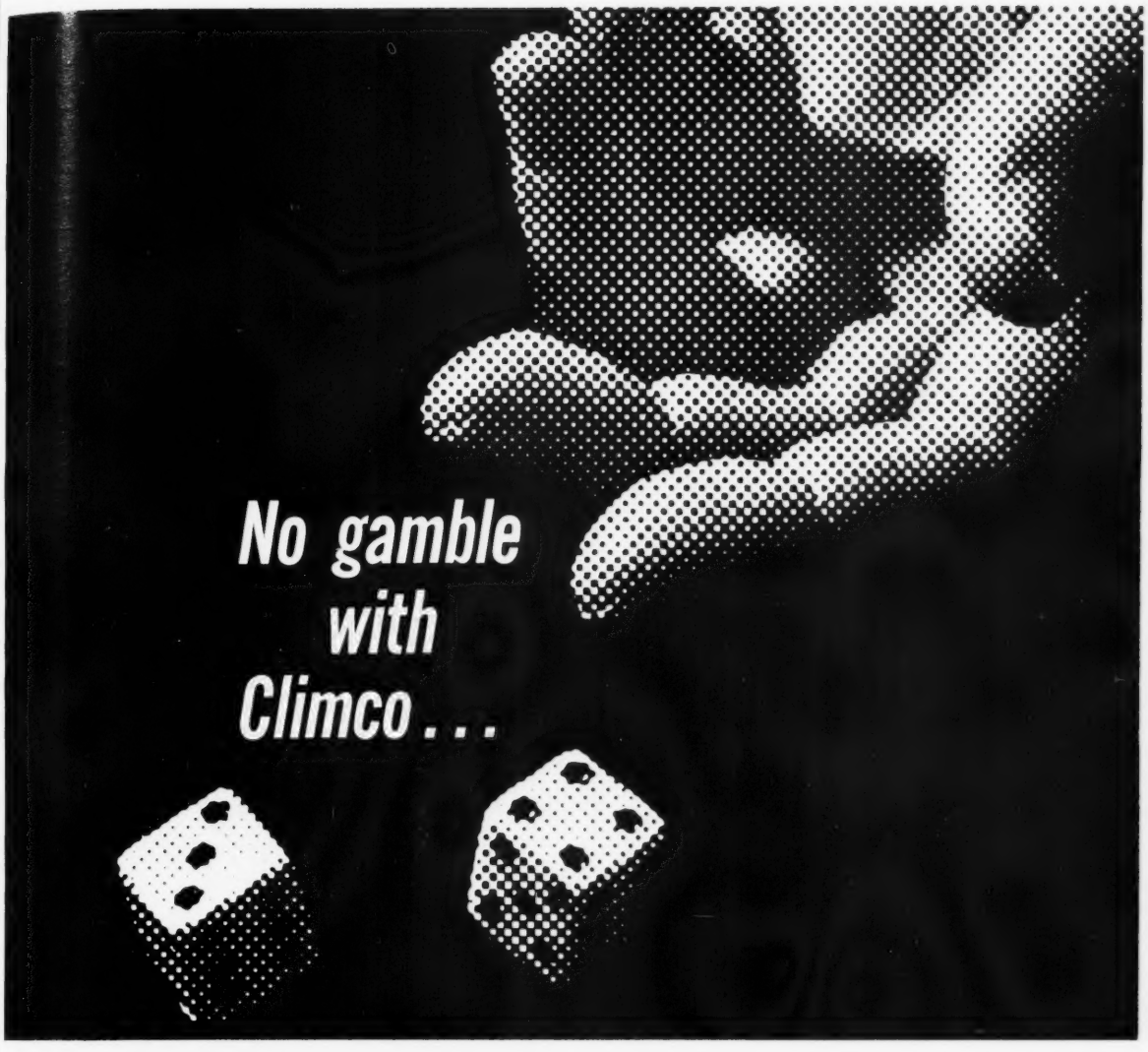

LINERETTE PAPER

beats adhesion in lightweight stocks

Every roll is tops in quality – Linerette Paper preserves tack but provides quick and easy separation of lightweight stocks. Linerette eliminates objectionable cloth marks . . . contains no oil or wax that might migrate to stock. In die-cutting operations, clippings can be worked away with regular scrap; where cleanliness is essential, Linerette is a low-cost lining for trays and containers. Stocks can be calendar-fed into Linerette and shipped that way to avoid return charges on fabric.

Along with these advantages, Linerette Paper has versatility in size as well. It is available in any width up to and including 54″, in rolls of 9″, 11½″, 13″ and 15″ diameters, on cores of 3″ i.d. The yield is approximately six square yards to the pound. A 9″ roll contains approximately 375 linear yards and a 15″ diameter approximately 1150 linear yards. Odds are that you can benefit right now with Linerette. Ask for sample and prices today; just specify the width required.

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THIS MAN

RUBBER

But knowing ONLY rubber often won't give Copolymer customers the right answer to their questions . . . the *exact solution to their problems.* Southeastern Area Sales Representative GRANT C. RICKARD is a good example of a Copolymer man with that special, added measure of know-how that sometimes pays off BIG for users of rubber products. Yes, *he knows rubber* . . . he has extensive technical training; he is widely experienced in rubber industry chemicals; and he keeps posted in related fields that broaden his viewpoint, sharpen his thinking, increase his ability to select the best rubber for *your* requirements. You'll appreciate his attitude, too. Typical of Copolymer representatives, he's a real "customer's man" through-and-through.

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B. G. Hutchison	Chicago, Illinois SKyline 6-0500
Grant Rickard	Atlanta, Georgia PLaza 3-7833

West Coast Sales Agent:

B. E. Dougherty Company	Los Angeles, California MAdison 4-9511
	San Francisco, California YUkon 6-5493

new equipment

(Continued from page 48)

Flameless Heating

Catalytic Combustion Corp., Detroit, Mich., has introduced what is described as a completely controllable, flameless, catalytic method of producing low-temperature infrared heat for curing, bonding, baking, drying, preheating, softening, evaporating.

The heater converts LP gas energy directly to infrared heat energy on a catalytically active metal screen which acts as the radiant heat source. Surface temperature of the catalyst screen can be held automatically at any point between 800 and 1500° F. by proportionate control of the gas flow.

Heating panels are available in standard sizes and are designed to provide heat release rates between 2,000 and 12,000 BTU per hour per square foot of emission surface, equivalent to a range of 4 to 24 watts per square inch.

In the heater, a mixture of air and fuel gas is supplied through an enclosed manifold, passing through a high-temperature ceramic diffusing medium, and then through a catalytically active metal gauze, which consumes the fuel on the catalyst surface below the flammable range; the temperature depends only on the ratio of the air-gas mixture. A small pilot burner is applied to the outer surface to light. In 60 seconds the flame dies out, and catalysis will take over.

The company reports the unit gives direct conversion of gaseous fuel energy at the point of combustion, giving high conversion efficiency, and the catalyst emission can be placed close to the product, producing low heat losses and speeding up curing, baking, and drying times. The catalyst surface can be manufactured in a variety of shapes and sizes to fit the contour of the work being processed.

Business Computers

The Remington Rand Univac Division of Sperry Rand Corp., New York, N. Y., has introduced three new computer developments which are expected to improve greatly use of computers for business purposes, as well as for scientific and military uses.

The three developments are a "thin-film computer memory," which will make possible computers that operate in billionths rather than millionths of a second; the Univac 490 Real-Time system, a communications-computer network which will provide inventory and production control data instantaneously to companies with widely scattered plants, offices, and warehouses, and COBOL (Common Business Oriented Language) compiler systems which make it possible to program computers in English rather than in the specialized computer language.

The thin-film magnetic memory is made by depositing vapors of iron, nickel, cobalt, or other

(Continued on page 140)

In my territory, here in the Southeast, I find rubber products plants springing up everywhere. In case after case, Copolymer's complete, tried-and-proven lines of non-pigmented polymers, dispersant-free black masterbatches, and quality latices are solving problems and *working better* for users.

A really complete line of COPO® non-pigmented polymers (1006, 1500, 1502, 1505 NS, 1507, 1510, 1712, 1773, 1778) is available. No matter what your need may be, we have the polymer that will fill it.

Favorable reports continue on our black masterbatches, the "one and only" CARBOMIX® line. This family of products is a landmark in Copolymer research, development, and production history. Users enjoy consistent savings in time, labor and operating costs while increasing production and improving housekeeping conditions.

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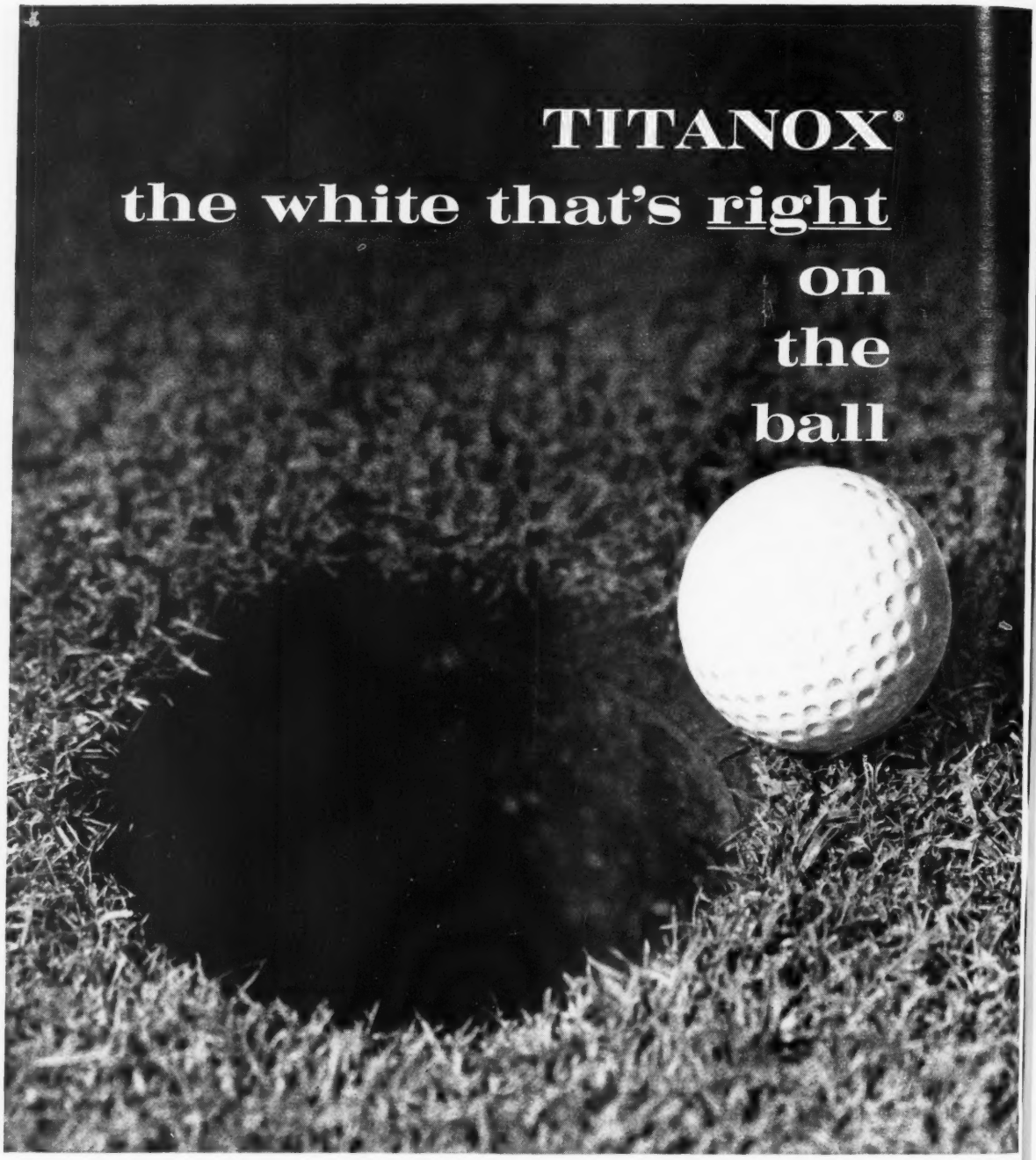

To give their products outstanding visibility on the fairway and at the sales counter, golf-ball manufacturers rely, among other things, on an unbeatable threesome that includes the right compounding ingredients, the right vulcanizing conditions and the right TITANOX pigments.

These white titanium dioxide pigments are ideal for whitening and brightening golf balls—from the raw material used for cover stock to the final bright coating applied to the finished ball.

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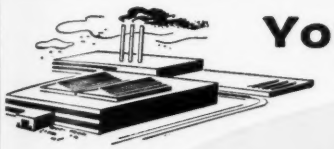

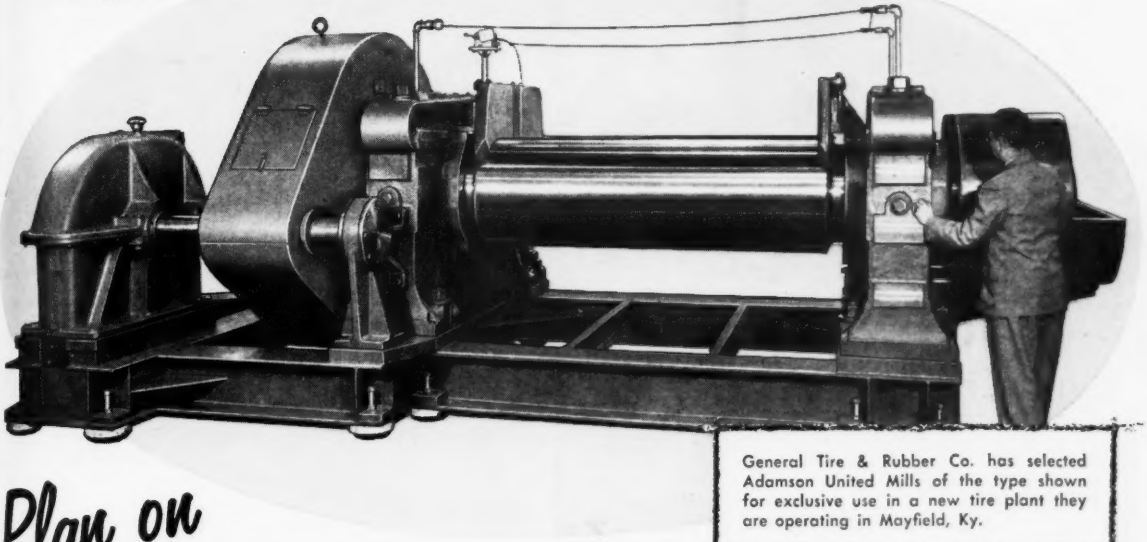

General Tire & Rubber Co. has selected Adamson United Mills of the type shown for exclusive use in a new tire plant they are operating in Mayfield, Ky.

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technical books

NEW PUBLICATIONS

"Accelerators, Pigments and Plasticizers for Hycar Rubber." Manual HM-7. B. F. Goodrich Chemical Co., Cleveland, O. 66 pages. This manual discusses characteristics of a variety of curing systems, black and non-black pigments, extenders and plasticizers, with tables on curing characteristics, physical properties, and aging.

"Heat Resistant Elastomeric Material Combinations and Forms." By R. E. Stapleton and others. Trionics Corp. for Bureau of Aeronautics, United States Navy. 39 pages. (Order PB 161813 from OTS, United States Department of Commerce, Washington 25, D. C.) Price $1.25. This research report details results of Navy tests to find non-elastomeric substitutes for present elastomeric materials in such items as O-rings, flexible hose, sheet gasket stock, and sealing and potting compounds. These items were wanted for flexibility over a temperature range of −70 to 1000° F. Tests showed that materials with high-temperature serviceability, such as ceramics, glasses, and metals, could be substituted for rubber or other elastomeric materials by fabricating them into a form such as a spring, fiber, or thin sheet with enhanced flexibility or elasticity, and fabricating this form into the final product desired. The report says, however, a more fundamental approach is required to develop a high-temperature elastomeric material with universal applicability.

"Be Safe." Eco Engineering Co., Newark, N. J. This 9- by 12-inch cardboard wall poster, distributed free, is designed to warn inexperienced shipping, receiving room, and operating personnel against possible accidental combinations of various commonly used chemicals that cause many fires, explosions and asphyxiations each year.

"Cross-Linkage of Natural Rubber." Summary Technical Report STR-2518. Office of Technical Information, National Bureau of Standards, Washington 25, D. C. 7 pages. This publication describes experiments by L. Mandelkern and D. E. Roberts, of the Polymer Structure Section of the National Bureau of Standards, on the effects of cross-linkage on properties of natural rubber. They found that properties depend not only on the number of linkages present, but on whether the chains are random or whether they have been oriented by racking.

"Official Class B Product List and Product Assignment Directory." Business & Defense Services Administration, United States Department of Commerce. 155 pages. (Copies may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., or from any U. S. Department of Commerce Field Office.) Price, 70¢. The directory is a revised version of the publication used by defense, atomic energy, and space contractors and suppliers in connection with defense work. It includes a substantial revision of the item code numbers, plus some changes in the listing of products.

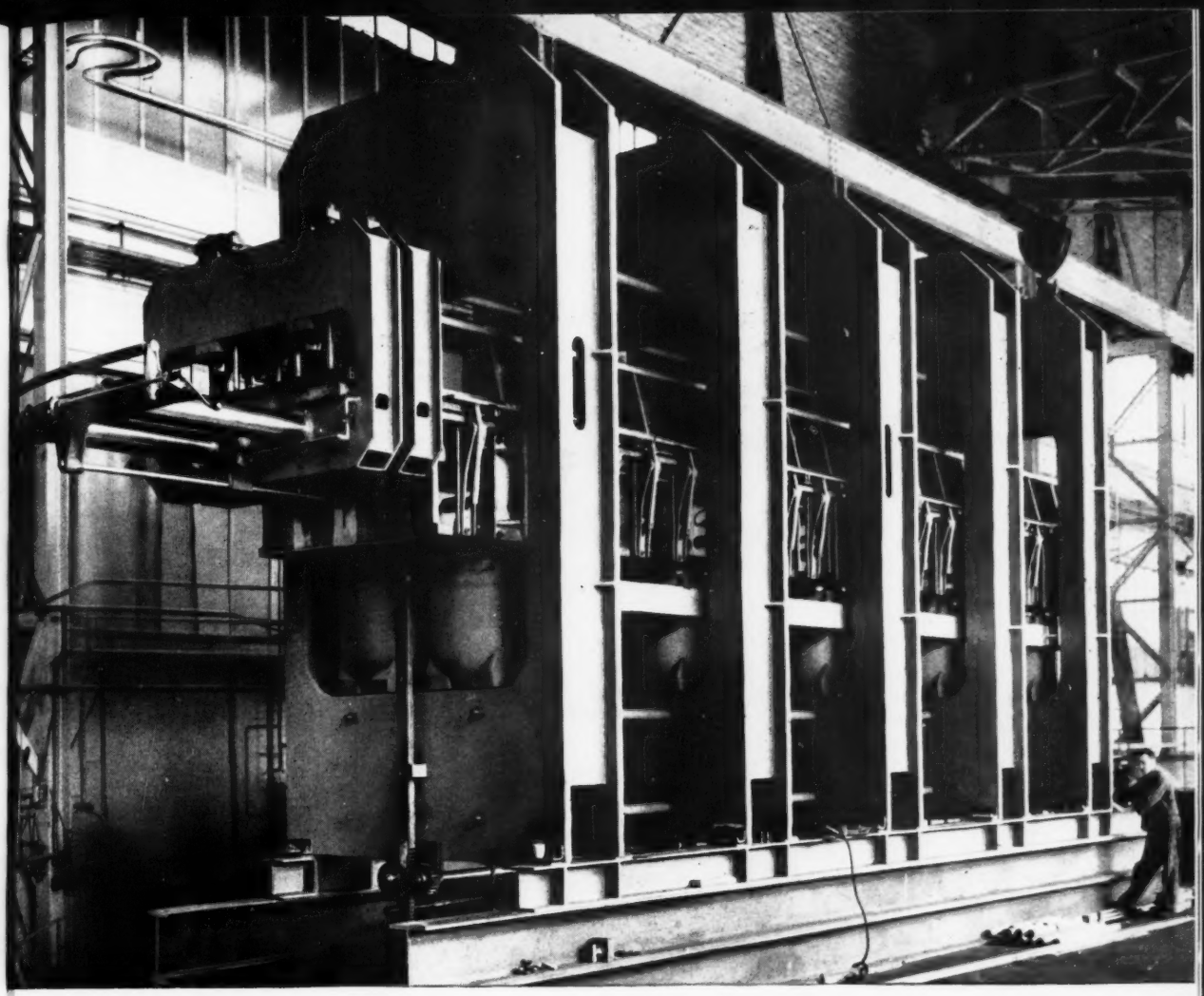
"Caustic Soda." U. S. Industrial Chemicals Co., division of National Distillers & Chemical Corp., New York, N. Y. 40 pages. This new booklet gives complete chemical and physical properties of caustic soda. It features ten pages of graphs and tables, special sections devoted to determining costs of caustic shipments and to a discussion of the best methods of shipping and handling caustic soda, and complete analysis and first aid procedures.

"Chromalox Electrical Heating Units and Equipment for Industry." CS-600. Edwin L. Wiegand Co., Pittsburgh, Pa. 84 pages. This supplement to Catalog 60 contains newest items in the Chromalox industrial line.

"Model F-26TA-2 Electric Truck." Elwell-Parker Electric Co., Cleveland, O. 4 pages. This folder describes a 2,000-pound capacity truck designed for fast tiering of unit loads under restricted warehousing conditions. Drawings, photographs, and design and operating information are included.

"Gilmore Batch Weighing Systems." Bulletin B-100. Gilmore Industries Inc., Cleveland, O. 20 pages. This bulletin describes Gilmore tank weight indicators and control systems, with both manual and automatic controls.

"Dielectric Ovens." Bulletin 60-E. Young Brothers Co., Cleveland, O. 4 pages. Some of the distinctive features of dielectric ovens discussed in this illustrated brochure are: power tube protection against coolant failure or over-temperature, DC plate current overload, or grid under-current; all electrical and mechanical parts easily reached through access doors; rugged conveyor system with heavy-duty variable-speed drive, and heavy-gage wire mesh belt; adjustable take-up to compensate for stretch, and ball-bearing idler rolls to support return run; and load-monitor which automatically stops conveyor when power consumption reaches maximum permitted value and restarts conveyor when it drops to a predetermined level. Information is also included on radio-frequency power generators for dielectric heating.



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technical books

Publications of Goodrich-Gulf Chemicals Inc., Cleveland, O.:

"Ameripol 1011." Technical Data Release No. 134. 1 page.

"Ameripol 1012." Technical Data Release No. 135. 1 page.

"Ameripol 1013." Technical Data Release No. 136. 1 page.

"Micro-Black Masterbatch Ameripol 1808." Technical Data Release No. 137. 1 page.

"Micro-Black Masterbatch Ameripol 1809." Technical Data Release No. 138. 1 page.

Publications of Young Machinery Co., Muncy, Pa.:

"Young Pneumatic Conveyors." Bulletin P-259-A. 7 pages. This bulletin describes negative and positive pressure systems, closed circuit system and special applications, and the Young Machinery Co. components for the various systems.

"Materials Handling and Processing Equipment." Bulletin 102. Young Machinery Co., Muncy, Pa. 4 pages. This condensed catalog briefly lists pneumatic conveying systems, mixers, saw tooth crushers, hammer mills, blowers, feeders, pumps, and similar equipment.

"Rubber Products for Industry." Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. 23 pages. This new edition of the Raybestos-Manhattan catalog gives descriptions of the Division's Poly-V drive, V-belts, transmission belts, conveyor belts, and hose.

"Aliphatic Amines." Armour Industrial Chemical Co., Chicago, Ill. 24 pages. This booklet gives compositions as determined by gas chromatography and includes complete specifications, physical properties, reactions, and other data for primary, secondary, and tertiary amines along with specialty and polyethoxylated amines.

"Boston Belting Catalog." Boston Woven Hose & Rubber Division, American Biltrite Rubber Co., Boston, Mass. 36 pages. This catalog gives specifications and cross-section illustrations of each belt. Tables are included on belt weights, gages, and fabrics for particular jobs.

"Colormaster Differential Colorimeter." Bulletin CM-1200. Manufacturers Engineering & Equipment Corp., Hatboro, Pa. 10 pages. This bulletin describes the Colormaster, a tri-stimulus filter colorimeter to measure light. Also described are accessories for measuring color of rubber, plastics, yarn, fabric, and other types of samples.

"Special Silicone Rubber." Stillman Rubber Co., Culver City, Calif. 1 page. This bulletin discusses uses for fluorinated silicone rubbers, used where fuel and oil resistance is needed.

Publications of Natural Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

"Determination of Degree of Cross-Linking in Natural Rubber Vulcanizates. Part III." By L. Mullins. No. 335. 7 pages. This paper outlines changes in previous assessments of the degree of cross-linking brought about by recent studies of both the stress-strain properties of highly swollen rubbers, and the method of determining number-averaged molecular weight from intrinsic viscosity measurements, and the additional effect of the introduction of a correction for a network defect equivalent to chain entanglements.

"Interchange between Dialkyldithiocarbamates and Tetraalkylthiuram Disulfides." By B. Saville. No. 337. 2 pages. This paper describes the interchange process under a number of conditions, noting that the process may be pertinent to the function of dialkyldithiocarbamates in sulfur vulcanization of rubber.

"Recent Developments in the Malayan Rubber Industry." By G. F. Bloomfield. No. 340. 8 pages. This paper deals with efforts to increase yield of Malayan rubber trees by replanting, use of plant hormones, and high intensity tapping, improvements in rubber processing methods, and experiments with new types of natural rubbers.

"Rupture of Rubber. Part IX. Role of Hysteresis in the Tearing of Rubber." By L. Mullins. No. 341. 10 pages. This booklet describes tests of the tear behavior of a group of butadiene-styrene and butadiene acrylonitrile rubbers not reinforced by crystallization, over a wide range of temperatures and rates of tearing.

"The Protection of Transparent Vulcanizates against Aging in Sunlight." By J. R. Dunn and S. G. Fogg. No. 351. 2 pages.

"The Reaction of 2, 4-Dinitrobenzenesulphenyl Chloride with Organic Monosulphides." By C. G. Moore and M. Porter. No. 352. 7 pages.

"Rupture of Rubber. Part VI. Further Experiments on the Tear Criterion." By A. G. Thomas. No. 353. 7 pages. **"Part VII.** Effect of Rate of Extension in Tensile Tests." By H. W. Greensmith. No. 354. 8 pages. **"Part VIII.** Comparisons of Tear and Tensile Rupture Measurements." By H. W. Greensmith. No. 356. 11 pages.

"Simple Rotary Dynamic Testing Machine." By A. N. Gent. No. 356. 3 pages.

"Determination of Degree of Cross-Linking in Natural Rubber Vulcanizates. Part. V. Effect of Network Flaws Due to Free Chain Ends." By L. Mullins and A. G. Thomas. No. 357. 9 pages. **"Part VI.** Evidence for Chain Scission during the Cross-Linking of Natural Rubber with Organic Peroxides." By C. G. Moore and J. Scanlan. No. 358. 11 pages.

"The Proteins of *Hevea Brasiliensis* Latex. Part VI. Isolation and Characterization of Crystalline Hevein." By B. L. Archer. No. 359. 5 pages.

(Continued on page 58)

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technical books

(Continued from page 56)

"Radiation Cross-Linking of Rubber. Part III. Chain Fracture." By L. Mullins and D. T. Turner. No. 360. 13 pages.

"The Use of Rubber in Engineering." By A. N. Gent. No. 361. 12 pages.

"Price List, October, 1960." Fritzsche Brothers, New York, N. Y. 12 pages. Flavors, colors, oils, fixatives, gums, and aromatic chemicals are included in this listing.

"Carey-Canadian Asbestos." Form 6461. Carey-Canadian Mines, Ltd., Cincinnati, O. 8 pages.

"Kentucky's Industrial Opportunities." Division of Industrial Promotion, 320-N12 State Capitol Building, Frankfort, Ky. 52 pages.

"Exact Weight Heavy-Duty Bench Scales, 9600 Series." Bulletin 3415. Exact Weight Scale Co., Columbus, O. 2 pages.

"Hannifin Hydraulic Power Units." Bulletin 0980-B1. Hannifin Co., Des Plaines, Ill. 6 pages.

"Pangborn Standard Duty Rotoblast Barrels." Bulletin 706. Pangborn Corp., Hagerstown, Md. 16 pages.

"Rapistan Adjustable Pressure Conveyor." Bulletin RS-708. Rapids-Standard Co., Grand Rapids, Mich. 8 pages.

"United Hytronic Die Cutting Machine." United Shoe Machinery Corp., Boston, Mass. 6 pages.

Plioflex 1510

(Continued from page 22)

duced by the chemical division, Goodyear Tire & Rubber Co., Akron, O. The SBR, Plioflex 1510, is also said by the company to have better-than-usual physical properties for a low viscosity rubber. It is recommended for closed-cell sponge, flooring, sporting goods, and other products that require high color standards.

Fatty Hydroxamic Acids

Two fatty hydroxamic acids, oleyl and C_{16}—C_{18}, are now available commercially from Woburn Chemical Corp., Harrison, N. J. Various uses of these chemicals in compounds include plastic modifiers, antioxidants, plasticizers, light stabilizers, and rubber accelerators.

Both oleyl and C_{16}—C_{18} hydroxamic acids have an approximately 90% purity, a waxy consistency, and an off-white color. The specific gravity of oleyl is 0.897 70/25° C, and of C_{16}—C_{18}, 0.900 70/25° C. Oleyl is insoluble in water and soluble in aqueous potassium hydroxide and organic solvents.

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Piccopale offers new approaches and economic advantages to compounders in many fields that demand alkali, acid and water resistance.

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Used as a compounding agent in the manufacture of mechanical rubber goods and general sundries, Claremont Flock Fillers provide reinforcement, improve tear and abrasion resistance. Claremont flock finishes for rubber fabrics provide a wide range of appealing textures that are uniform and long-wearing. In many applications the proper use of a Claremont flock will substantially reduce production costs.

Claremont's knowledge of the industry's needs and its capacity for large production and quick delivery have made it the country's foremost producer of cotton flocks. Samples will be furnished upon request for laboratory and test runs. Inquiries invited!

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new products

New Tread Design

Firestone Tire & Rubber Co. has announced a new truck tire that features a three-rib bladed tread design. This new design will give the tire 50% more mileage than previous 100-level Firestone original-equipment truck tires.

The Transport-100 is also claimed to outwear conventional truck tires because of a broad center rib with extra-large tread elements arranged in a rope-like pattern, and improved rubber compounds that enable tires to run cooler.

This all-wheel position truck tire also features built-in traction slots. The 10.00-20 size has a total of 1,008 traction blades in the tire mold, giving the Transport-100 excellent road traction.

Butyl Passenger Tire

United States Rubber Co., New York, N. Y., has introduced an all-butyl rubber passenger tire, which it says has greater traction than conventional tires made of SBR and will stop a car faster on a wet road than SBR tires on a dry road.

The tire has a low profile and an oval-shaped cross-section, with a single heavily inserted center rib almost the full width of the tread instead of the usual seven-row tread. The center rib is flanked by two narrow outer ribs. The new tire, the U. S. Royal Butylride, is tubeless, made with rayon cord. It comes in a full range of 14- and 15-inch sizes and features the narrow (less than an inch wide) whitesidewall pioneered by U. S. Rubber.

New Retreading Rubber

Seiberling Rubber Co., Akron, O., recently added a new premium retreading rubber to its line of tire repair materials for the second time in recent months. Joining Carbo-Kwik, the firm's new fast-cure retread stock, is another premium-level material called Carbo-Preme.

Offering the same wearing advantages as Carbo-Kwik, Carbo-Preme will also satisfy the needs of dealers who do not require the additional production capacity made possible by the use of fast-cure retreading rubber.

(Continued on page 68)

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Roebling Hose Wire, Hose Reinforcing Wire and Hose Wrapping Wire bear the stamp of Roebling's strict attention to constant uniformity. As with all Roebling wire products, each is wholly Roebling-made and Roebling-controlled, from open hearth to packaging. Tensile strength and forming qualities, finish and gage are of an excellence that proves itself in use.

Resistance to internal and external pressures and wear are what you look for in hose wires and what you pay for. With Roebling, you *get* them.

For further information on these and other Roebling quality products, write or call Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

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Stabilite, a chemical of the diaryl ethylene diamine series, increases remarkably the effect of other commercial age resistors. In combination with diaryl amine antioxidants, Stabilite provides outstanding resistance to oxidation for all rubber compounds through a full range of temperatures. It imparts unusual flexing properties, minimum discoloration, and lowers cracking effects due to sunlight. Even in small quantities, Stabilite produces greater smoothness in calendering and tubing, gives unusually fine plasticity, lessens sunchecking and enhances flex resistance.

Unlike the diaryl amine antioxidants, Stabilite functions with them to extend their total effectiveness. Since it is completely different chemically, it causes a reaction which actually doubles the value of the diaryl amine antioxidants. In tests conducted in our laboratories, 0.5% Stabilite plus 0.5% common diaryl amines showed effectiveness greater than 1% of either used alone. Through the proper use of Stabilite, processors of rubber compounds can enjoy reduction in costs while definitely improving the antioxidant properties of their products. For a complete report on antioxidant tests using Stabilite and commercial diaryl amines write or call the C. P. Hall Company, Akron, Ohio.

Stabilite is successfully used by manufacturers of air-bags, belting, hose, molded goods, automotive rubber items and tires.

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Polysar Latex 781 contains a unique stabilizer system which gives the latex good freeze-thaw stability and superior chemical stability in the presence of preformed resorcinol formaldehyde resins. Other features of this latex include good mechanical stability and low viscosity which contribute to easy and trouble-free pumping and storage.

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tests prove adhesive power of Polysar Latex 781

TIRE CORDS	2 ply nylon	2 ply rayon
Denier	840	1100
Average undipped breaking strength (pounds)	26	25.5
Approximate cord diameter (in.)	0.021	0.024
Adhesion results (pounds pull, using dip recipe below)	22.5	25.0
Pounds Pull using Polysar Latex 781 alone	24.5	-

typical laboratory dip recipe

(using a rubber to resin ratio of 100 20)

INGREDIENT	Parts by Weight Dry	Wet
Polysar Latex 781 (42%)	80.0	190.5
Polysar Latex IV	20.0	47.6
Resorcinol	13.0	13.0
Formaldehyde (36.7%)	7.0	19.1
Sodium Hydroxide (10%)	0.8	8.0
Water—for resin solution	-	306.5
Water—for dilution	-	19.3
TOTALS . . .	**120.8**	**604.0**

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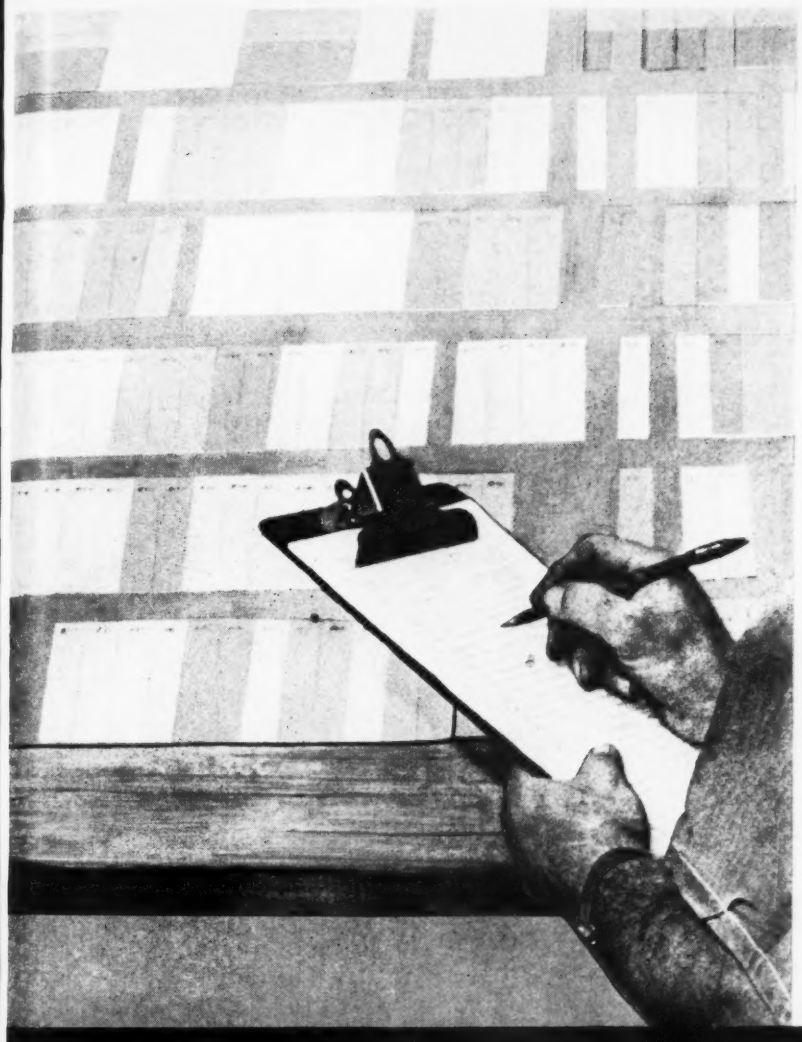

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PENNOX C—Exceptionally resistant to discoloration in light-colored latex products; provides good protection for Hevea and SBR vulcanizates.

PENNOX D—Excellent antioxidant for latex products, dry Hevea and SBR compounds.

For effective age resistance Pennox Antioxidants

In the Pennox series you'll find a dependable age resister suitable for most rubber compounding situations. Pennox antioxidants protect Hevea and SBR vulcanizates, raw SBR polymer, and latex products from the deteriorating effects of heat and oxidizers . . . also provide superior gas fading protection for latex, and minimize discoloring of fabrics coated or used in contact with latex products.

For detailed information on the Pennox series, write or ask your Pennsalt representative for Bulletin S-151, Pennox Antioxidants; and Bulletin S-152, Pennox Antioxidants for Latex. Evaluation samples available on request.

Pennox is a trade name of Pennsalt Chemicals Corp.

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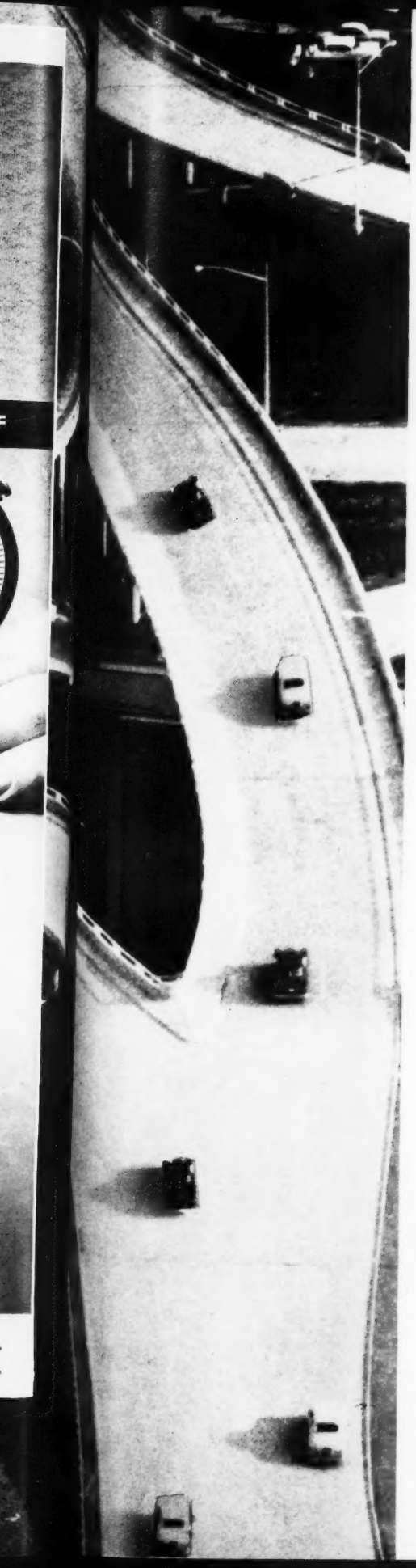

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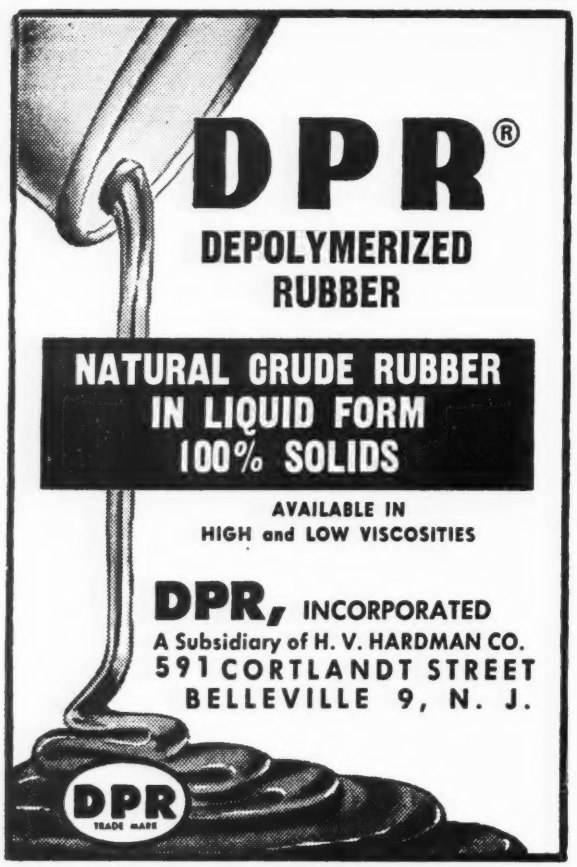

new products

(Continued from page 60)

All shipments of the new product are being made in the company's new tread rubber shipping box, the Suspenda-Pak, featuring a special insert which suspends the rubber at the center of the roll, preventing flat-spotting. It is the first such box in use in the industry at no added charge to dealers.

Pure natural rubber is used as a seal and cushion on portable respirators to aid people suffering from polio, asphyxiation, and respiratory ailments. B. F. Goodrich Industrial Products Co., Akron, O., supplies the rubber which J. J. Monaghan Co., Inc., Denver, Colo., die cuts and forms to fit over an opaque, light green plastic shell that goes over the patient's thorax and abdomen. (Above picture shows transparent shell for demonstration purposes.) A strip of inflatable polyurethane sponge on the inside edge of the rubber seal gives added cushioning. The entire unit is lightweight (a medium adult size weighs 36 ounces) and its portability allows the patient to move freely. The respirator comes in special as well as in 14 standard sizes.

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Creped Paper Labeling Tape (C-657 yellow and C-658 white), especially designed for irregularly shaped objects, is being produced by Arno Adhesive Tapes, Inc., Michigan City, Ind.

The new tape has a stain-resistant creped paper backing and a high-tack non-staining rubber-based pressure-sensitive adhesive. The special back coating will receive and hold a standard printing ink without offsetting, and the creped backing is conformable to irregular surfaces, as well as being water and weather resistant. The adhesive is firmly bonded to the backing and will remain bonded to a clean dry surface as long as necessary.

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"Barclay Rolls." Bulletin 601. Barclay Machine Inc., Salem, O. 4 pages.

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1. Volatile Matter	—	0.75%	0.25%	3-6
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3. Organic Acid (Stearic)	4.75%	6.75%	5.75%	30-35
4. Free Soap	—	0.50%	0.05%	36-40
5. Bound Styrene	22.5%	24.5%	24.0%	25-29
6. Viscosity, Raw Polymer ML 212 F @ 4 minutes	46	56	50	ASTM D927-57T
7. Viscosity, Compounded ML 212 F @ 4 minutes	—	70	60	

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Tensile strength, psi	2000
Elongation, %	850

ARE YOU processing products such as: electrical blankets, mechanical cover stocks, wringer rolls, athletic goods, medium heat resistant stocks, tape cement, electrical pads, hospital sheeting, electrical parts, gaskets, for which ASRC 3106 is ideally suited? If so, ask your ASRC man to show how ASRC 3106 can become a real money-saver for you, too. *Call him today!*

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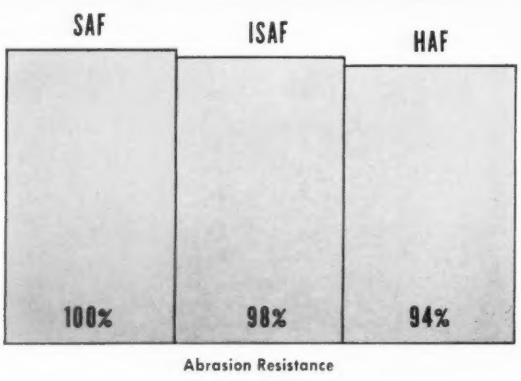

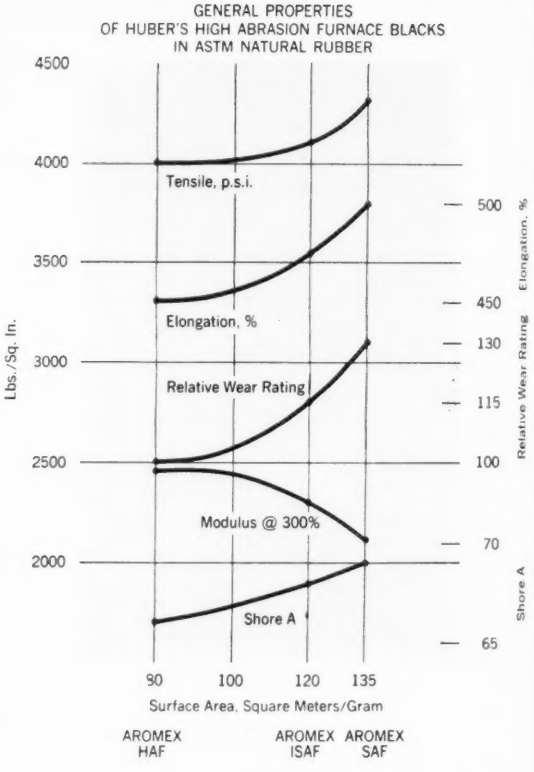

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The Rubber Chemist—What of His Future?

There is no doubt that the rubber chemist has been one of the most important cogs in our industry in bringing along new products, new developments, and new processes as well as in being a prime trouble shooter and adviser to production departments.

This position is usually one of the most important in a rubber manufacturing company, with the person occupying it involved in the many management decisions concerning products and processes. In recent months, however, there have been many instances where those responsible for overall plant management have become convinced that compounding by the "trial and error" method is not sufficient for today's fast moving pace. The requirements imposed by automatically controlled mixers, extruders, calenders, and presses make it mandatory that processing characteristics of a compound be completely predictable without extensive trial runs or constant changes during production. The stock answer, "We have too many different compounds to be able to use automatic controls," no longer satisfies managers who seek to make their plant more efficient, make better use of workers, and improve the quality level of the products to that expected by customers.

These managers are turning, in increasing numbers, to statisticians, engineers of other disciplines, or other specialists who may find keys to unlock yet unsolved secrets of rubber compound behavior. Managers refuse to believe that advancing technology cannot devise compounds and processes which will be essentially identical and fit into predetermined schedules without depending upon the skill of the operator to make constant adjustments.

Are you rubber chemists meeting this new challenge? Are you planning your compounding studies for maximum effectiveness? Are you searching for more basic information in your studies? Are you trying to devise the better tests, scientific insight, and new concepts needed? Or are you "meeting the spec." and hoping that "the way it has always been done" will be enough?

In short—are you going to be in the forefront of progress, or a tag-a-long?

Suppliers Can Help

A major source of informative help will continue to come from the suppliers who have done much in the past to supply much technical data along with raw materials.

This help takes many forms: technical bulletins, technical service, and advertisements in publications.

Every survey of our readers, many of our visits, and many of our letters and phone calls constantly reaffirm to us the great desire on the part of our readers to find sound technical information in the advertising pages of our journal as well as in the editorial pages.

We are very proud of the many advertisers who do provide much good information in the copy sent to us and are glad to have this help in making maximum use of the available page space.

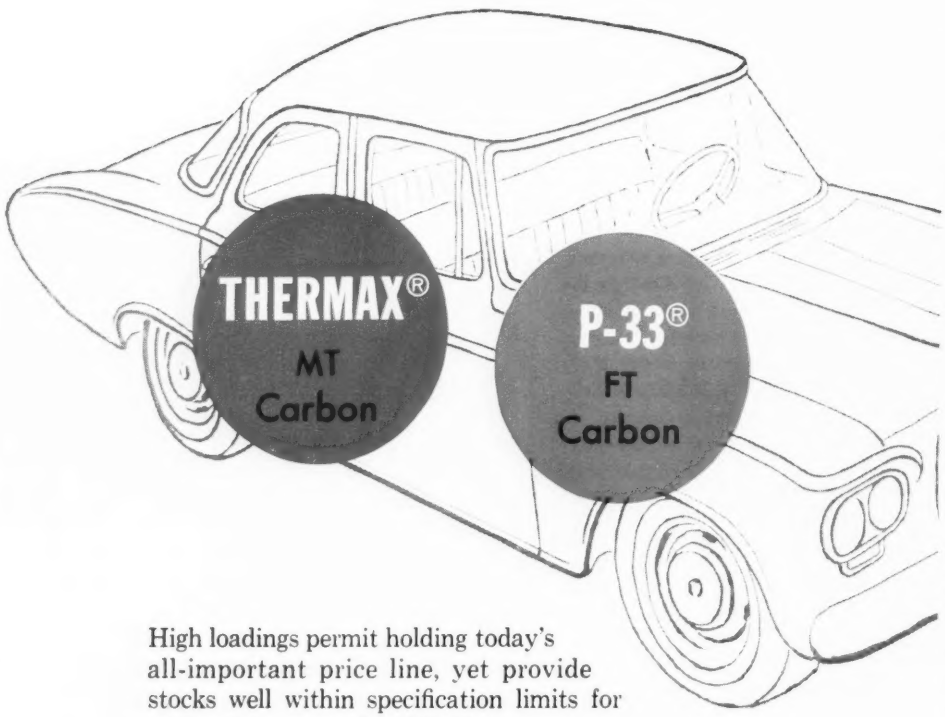
We were particularly struck, however, by the first ad of a series, which starts this month in RUBBER WORLD, from United Carbon Co. which tackles carbon black in a very basic manner and should be a big help to the chemist in orienting himself on the use of carbon black.

We hope that other suppliers will take a hard look in their files and see if they don't have basic information to educate the young and reeducate the older compounder.

R. S. Walker

EDITOR

Ideal for automotive...



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The Chemistry of Carbon Black In Rubber Reinforcement[1]

It is demonstrated that combined oxygen on the surface of carbon black plays a relatively minor role in the chemical effect of carbon black upon rubber reinforcement; the nature of the carbon surface itself plays the major role

By C. W. SWEITZER, K. A. BURGESS, and F. LYON

Columbian Carbon Co. Research Laboratories, Princeton, N. J.

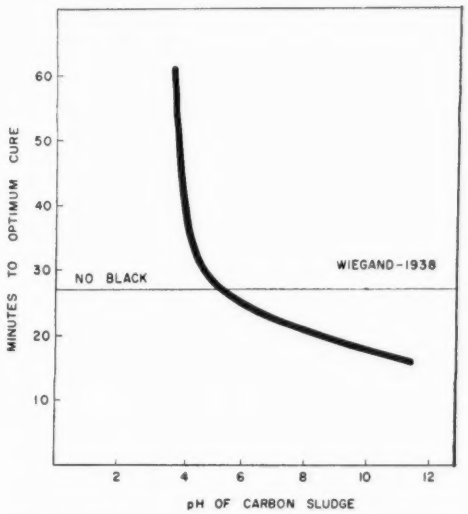


Fig. 1. Carbon black pH *versus* optimum cure for a natural rubber compound which was cured with diphenyl guanidine

IT IS generally recognized that the three primary properties of carbon black involved in the reinforcement of rubber are particle size or surface, structure, and surface chemistry. Electron miscroscope investigations in the early 1940's provided the means for rationalizing the reinforcement contributions of particle size and structure. The role of carbon surface chemistry, on the other hand, while extensively studied, has to a large extent remained unsolved.

Wiegand and Snyder (1)[2] in 1938 studied the acidic and basic properties of carbon black by pH measurements and correlated pH with cure rate, as shown in Figure 1. This work was one of the first attempts to rationalize the effect of carbon black surface chemistry on rubber reinforcement, and the studies indicated that the chemistry of the carbon black particle could play a significant role in the behavior of carbon-rubber compounds. Since then the bulk of the work in this area has been directed to the identification of oxygen-containing groups on the carbon surface.

Villars (2) measured active hydrogen on the surface of carbon black by the use of the Grignard reagent and determined that about 26% of the total oxygen reacted with the methyl magnesium iodide Grignard reagent and from the quantity of methane evolved concluded that of this amount of reactive oxygen about 14% is bonded to an active hydrogen. Smith and Schaeffer (3) observed a number of oxygen-containing groups in the electronically excited emission spectra of carbon black. Studebaker (4), using the reaction of carbon black with diazomethane as his criterion, reported the presence of hydroxyl and carboxyl groups on the carbon black and also suggested the possibility of 1,4-quinone groups being present. More recently Hallum (5) demonstrated by polarographic and infrared spectroscopic methods the presence of hydroxyl and quinone groups on the surface of carbon black. Garten (6) after extensive study concluded that the functional groups primarily responsible for chemical interaction with rubber were f-lactone groups on acidic carbons and chromene groups on basic carbon blacks.

[1]Presented before the Division of Rubber Chemistry, ACS, New York, N. Y., Sept. 15, 1960.

[2]Numbers in parentheses refer to Bibliography at end of article (except in tables, where they refer to footnotes).

TABLE 1

PROPERTIES OF HEAT-TREATED CARBONS

Carbon	Statex 125			Micronex W-6		
Heat Treatment	None	Devolatilized (1)	Graphitized (2)	None	Devolatilized (1)	Graphitized (2)
Properties						
Color (3)	140	141	146	151	153	159
Tinting Strength (3)	116	114	101	107	106	101
Oil Absorption (4)	13.6	15.8	14.2	13.2	15.2	14.5
N_2 Adsorption (5)	107	114	94	109	90	71
I_2 Adsorption (6)	104	119	100	75	92	84
% Volatile	2.0	0.4	0.05	5.7	0.3	0.09
pH	7.2	9.9	10.0	4.4	9.8	10.0
Total Acid (7)	72	2	0	228	5	0
Ionized Acid (8)	1	-11	-2	2	-15	-1

(1) Heat treated 2 hours at 1950°F. under nitrogen
(2) Heat treated 2 hours at 3500°F. under nitrogen
(3) According to Sweitzer & Goodrich, Rubber Age, 55, 469 (1944)
(4) Stiff Paste - Ball End Point - gallon/100 lb.
(5) Surface Area in M^2/g by BET method
(6) Mg/g according to ASTM - D1510
(7) Equivalents NaOH x 10^6 neutralized/gram
(8) Equivalents Acid or Base x 10^6 released on treatment with NaCl/gram

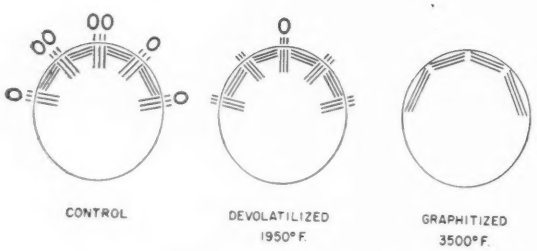


Fig. 2. Schematic diagram of carbon black particle both before and after heat treatment at 1950 and 3500° F., showing extent of loss of chemisorbed oxygen and degree of crystallite rearrangement

In contrast to the extensive investigations on the chemical nature of the oxygen functional groups on the carbon black surface, the chemistry of the underlying carbon surface itself has received relatively little attention. This lack of interest is understandable in the case of channel black where the amount of surface oxygen is sufficient to form a mono-layer over the whole surface. Whether or not such a layer actually exists is, of course, not known. A major portion, at least, of the channel carbon surface is covered with oxygen atoms chemically combined in one way or another with the carbon. In the case of furnace carbons, with smaller amounts of surface oxygen, the nature of the carbon surface itself would be expected to play a relatively more important role. Such surface-active carbon could arise from the nature of the aromatic polynuclear structures comprising the surface layer. Such structures are relatively active, especially in complexing reactions; some of the bonds in the polynuclear aromatics exhibit a relatively high degree of bond order. In addition, the presence of unpaired electrons in carbon black has been shown by Collins *et al.* (7), and their influence on rubber properties, particularly modulus, has been demonstrated by Kraus and Collins (8) and Watson and Jervis (9).

The purpose of the present paper is to probe further into the role of oxygen functional groups and carbon surface activity, with the emphasis on the effects produced in the reinforcement of rubber rather than on the analysis of surface details. This type of effort might be termed a macro approach to the problem as opposed to the micro approach.

Experimental Details

To follow the above-mentioned macro approach a series of treated carbon blacks was prepared to provide a wide variety of single variable changes in the quantity and type of surface chemistry on two standard tread rubber carbons, EPC and ISAF. For convenience in testing and discussion these carbons are placed in two groups according to the primary treating process employed, removal of chemisorbed oxygen, and the addition of chemisorbed oxygen.

Removal of Chemisorbed Oxygen

The carbon blacks employed were Micronex W-6[3] and Statex 125,[3] representing the EPC and ISAF grades, respectively. In most of the work reported in this paper the chemisorbed oxygen was removed by heat treating under a nitrogen atmosphere at 1950° F. for two hours. This *devolatilization* treatment is sufficient to remove all oxygen from channel black, but higher temperatures are necessary for the complete removal of oxygen from furnace blacks (10). Incomplete removal of oxygen from furnace blacks together with a likely slight re-oxidation of the carbon surface at room temperature before testing, results in a residue of oxygen on carbon blacks treated in the foregoing manner. The treatment is known to have little effect, however, upon the crystal-

[3]Columbian Carbon Co., New York, N. Y.

K. A. Burgess

C. W. Sweitzer

Francis Lyon

The Authors

Carl W. Sweitzer, director of research, Columbian Carbon Co., received his B.A., M.A., and Ph.D. degrees from the University of Toronto, the last in 1927. Dr. Sweitzer was a Senior Research Fellow at the Mellon Institute of Industrial Research from 1927 until 1938, when he joined Columbian Carbon as chief chemist. He was made director of research in 1951.

Kenneth A. Burgess, assistant director of research, Columbian Carbon Co., obtained his B.A. from Princeton University in 1939 and his M.S. in chemistry from Pennsylvania State University in 1941. He joined Columbian Carbon as a research chemist in 1946 and was made chief chemist in 1952 and assistant director of research in 1956.

Francis Lyon, manager of applied research on carbon black, Columbian Carbon Co., received his B.S. at Brooklyn College in 1949 and did graduate work in chemistry at the Polytechnic Institute of Brooklyn from 1949 until 1957. He joined Columbian Carbon in 1949.

lite arrangement of the carbon black; therefore the basic carbon black structure is left unchanged. The state of the carbon black particle after *devolatilization* is presented schematically in Figure 2.

Intermediate treating temperatures of 1400 and 2300° F. were applied to the ISAF carbon in several studies, with the effects on rubber properties shown graphically in Figure 4.

Both the EPC and the ISAF carbons were also partially *graphitized* by heat treating in a nitrogen atmosphere at 3500° F. for two hours. This treatment removed any residual oxygen functional groups and also rearranged the surface crystallites. The crystallite rearrangement was indicated by X-ray diffraction patterns which showed the general sharpening of the absorption bands and the occurrence of the 004 band typical of the graphitization process. The electron microscope also showed the change from a spherical to a polyhedral appearance characteristic of graphitized carbon black. This change in the crystallite structure of the carbon black particle is also shown schematically in Figure 2.

The specific changes in the chemical and physical properties accompanying these two treatments are tabulated in Table 1 for both the EPC and ISAF blacks and graphed in Figure 3 for the EPC black. The tinctorial, absorption, and adsorption results show that surface area and structure are relatively unaffected by the treatments.

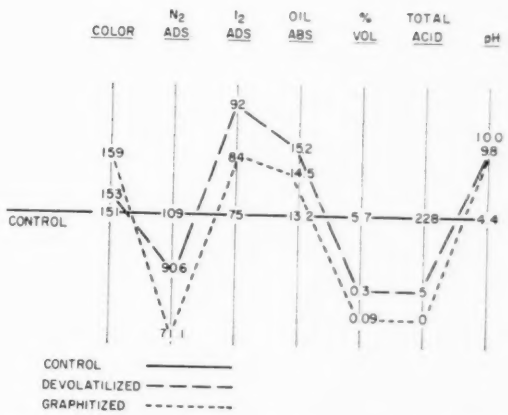


Fig. 3. Effect of heat treatment on the properties of EPC (Micronex W-6) carbon black

Electron microscope examination of the treated carbons revealed no change in particle diameter. The loss in % oxygen volatile, essentially complete for the graphitized carbons, is reflected in decreased total acid and increased pH.

TABLE 2

RUBBER PROPERTIES OF HEAT-TREATED STATEX 125 CARBONS IN SBR-1710 WITH 3 RECIPES

Recipe	DPG			Santocure *			Dicup		
Treatment	None	Devol.	Graph.	None	Devol.	Graph.	None	Devol.	Graph.
Vulcanized Properties (Cured at 293°F)									
Optimum Cure (1)	40'	37'	37'	25'	25'	27'	25'	23'	23'
20' L-300	690	660	260	1090	1170	240	860	1130	300
20' Tensile	2230	2520	2240	2920	3140	2640	2260	2680	2010
90' L-300	1970	1740	480	2660	2350	720	-	-	880
90' L-500	-	-	1430	-	-	2140	-	-	-
90' Tensile	3340	3180	2810	3360	3320	3100	2670	2510	1970
90' Elong.	445	480	670	365	390	570	275	255	455
90' S.H.	58	57	50	63	62	54	59	62	51
Log R	4.3	2.5	2.2	3.7	2.2	1.8	3.8	2.4	1.9
Rebound	51.0	43.7	37.4	53.9	48.7	42.4	60.5	57.9	46.9
Dispersion(Visual) (2)	8.0	7.8	7.3	8.0	8.3	7.5	8.0	7.8	7.5
Dispersion (Mic.) (3)	99	99	98	99	99	99	98	98	97
Crescent Tear (4)	225	260	122	166	242	80	88	108	68
De Mattia Flex (5)	3.2	3.8	3.8	3.2	3.8	6.8	2.5	2.1	3.8
Crosslink Density (6)	138	152	127	194	208	177	126	147	104
Unvulcanized Properties									
Mooney Visc. (7)	56.0	60.0	62.5	-	-	-	59.5	62.0	63.0
Mooney Scorch (8)									
5 Units	4.3	3.7	3.0	10.5	10.1	9.2	3.1	2.0	2.0
35 Units	7.6	6.5	5.2	12.4	12.2	13.7	5.1	3.5	3.2
Carbon Gel (9)	33	31	-	34	31	15	29	31	13

(1) Estimated from Scorch and Stress Strain results
(2) Rating on torn surface
(3) % Below 9 microns
(4) Tested at 212°F, at 100% overcure (lbs/in)
(5) KC to 50% failure (pierced groove) at room temp.
(6) $\times 10^6$, moles/cc.
(7) ML-4-212°F
(8) ML-293°F
(9) % insoluble rubber

* Overcure Stress Strain data at 60' in Santocure series

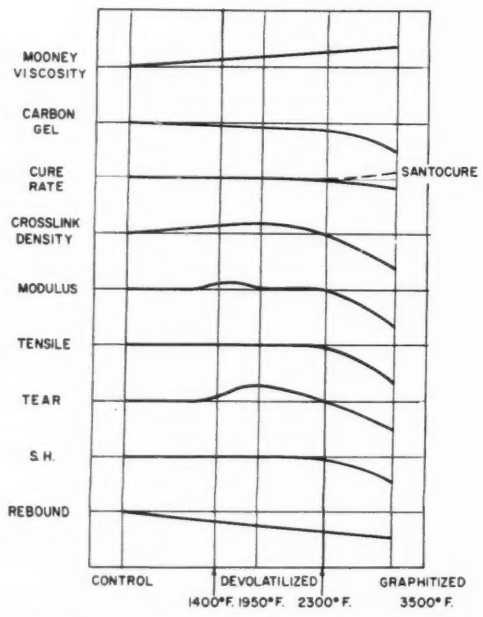


Fig. 4. Effect of heat treatment of ISAF (Statex 125) carbon black on the physical properties of SBR 1710 and natural rubber compounds cured with DPG, Santocure, or Dicup

Effect of Removal of Chemisorbed Oxygen on Rubber Properties

The heat-treated carbons, that is, the devolatilized and graphitized, together with the control, representing successive steps in the removal of functional groups and carbon surface chemistry, were tested in the two polymers and the three curing systems shown below.

	Recipes					
	SBR 1710			Natural Rubber		
	1	2	3	1	2	3
Rubber	100	100	100	100	100	100
Carbon black	50	50	50	50	50	50
Zinc oxide	3	3	—	3	3	—
Stearic acid	2	2	—	2	2	—
DPG	4	—	—	2	—	—
Santocure (1)	—	1	—	—	0.4	—
Sulfur	2	2	—	2.5	2.5	—
Dicup (2)	—	—	3	—	—	3

(1) N-cyclohexyl 1,2 benzothiazole sulfenamide, Monsanto Chemical Co., Rubber Chemicals Department, Akron 11, O.
(2) Dicumyl peroxide, Hercules Powder Co., Wilmington 99, Del.

The selection of these three curing systems, that is, DPG-sulfur, Santocure-sulfur, and dicumyl peroxide as crosslinking agents, was made for two reasons. First, there was the increasing body of evidence that a large part of the reinforcing action of carbon black occurs during the vulcanization step, both by direct action with the polymer (11), and by interaction with the curatives. Second, the recent evidence that the curing reaction may proceed by a polar, a mixed polar-free radical, or a completely free radical mechanism (12), made it desirable to study the effect of carbon black surface chemistry on the vulcanization reaction as a function of the type of curing reaction. These curing

TABLE 3

RUBBER PROPERTIES OF HEAT-TREATED STATEX 125 CARBONS IN NATURAL RUBBER WITH 3 RECIPES

Recipe	DPG			Santocure			Dicup		
Treatment	None	Devol.	Graph.	None	Devol.	Graph.	None	Devol.	Graph.
Vulcanized Properties (Cured at 293°F)									
Optimum Cure (1)	15'	15'	15'	20'	20'	23'	20'	20'	18'
10' L-300	1670	1480	480	1510	1440	460	1080	980	370
10' Tensile	3560	3590	2610	2960	3600	2340	1790	2120	1970
45' L-300	2930	2400	790	2460	2270	730	-	2760	890
45' L-500	-	-	2400	-	-	2100	-	-	2860
45' Tensile	4030	4090	3410	3820	4100	3420	3260	3700	2910
45' Elong.	450	485	605	430	495	635	285	365	505
45' S.H.	66	64	62	64	63	61	61	60	58
Log R	3.1	2.1	2.0	3.3	2.1	1.8	3.6	2.3	2.0
Rebound	68.4	64.6	61.5	67.3	65.1	61.0	70.7	69.0	65.1
Dispersion (Visual) (2)	6.0	8.0	8.0	6.5	8.5	8.0	4.8	7.5	8.5
Dispersion (Mic.) (3)	85	98	98	85	96	99	85	96	99
Crescent Tear (4)	468	418	318	280	360	247	284	339	132
De Mattia Flex (5)	8.4	8.3	7.1	43.7	100.1	7.9	6.6	57.0	3.2
Crosslink Density (6)	242	235	150	151	175	127	209	198	140
Unvulcanized Properties									
Mooney Vis. (7)	78.0	78.0	69.0	-	-	-	77.5	2.0	89.5
Mooney Scorch (8)									
5 Units	2.8	2.0	1.3	4.9	4.7	5.5	2.6	2.1	1.5
35 Units	3.6	2.7	3.5	5.8	5.8	7.9	3.4	2.9	2.2
Carbon Gel (9)	52	51	35	59	52	44	48	49	36

(1) Estimated from Scorch and Stress Strain results
(2) Rating on torn surface
(3) % Below 9 microns
(4) Tested at 212°F., at 100% overcure (lbs/in)
(5) KC to 50% failure (pierced groove) at room temp.
(6) $\times 10^6$, moles/cc
(7) ML-4-212°F.
(8) ML-293°F
(9) % insoluble rubber

TABLE 4

RUBBER PROPERTIES OF HEAT-TREATED MICRONEX W-6 IN NR AND SBR-1710 WITH SANTOCURE RECIPE

Treatment	NR			SBR-1710 (3)		
	None	Devol.(1)	Graph.(2)	None	Devol.(1)	Graph.(2)
Vulcanized Properties (Cured at 293°F)						
Optimum Cure	35'	30'	40'	30'	20'	25'
10' L-300	800	1240	220	200	980	160
10' L-500	1790	3710	1060	1000	3060	1810
45' L-300	1730	1860	540	1480	1760	500
45' L-500	3640	3680	1670	3020	-	1490
45' Tensile	3640	4160	3600	3260	2940	3000
45' Elong.	500	550	690	525	430	635
45' S.H.	59	61	58	59	59	50
Log R	7.9	2.5	1.8	7.5	2.6	1.9
Rebound	70.7	67.3	61.5	53.9	49.6	42.8
Dispersion Visual	7.0	5.5	8.3	7.3	6.8	7.3
Dispersion Mic.	98	85	95	99	97	98
Crescent Tear	246	297	184	188	182	93
DeMattia Flex	38.1	8.4	7.7	2.6	5.3	4.1
Crosslink Density	151	175	127	176	199	165
Unvulcanized Properties						
Mooney Scorch						
5 Units	6.8	4.0	6.6	13.6	8.3	10.6
35 Units	8.5	5.2	9.3	17.7	10.8	15.3
% Carbon Gel	59	52	44	29	24	13

(1) Devolatilization - Heat treated 2 hours at 1950°F. under nitrogen
(2) Graphitization - Heat treated 2 hours at 3500°F. under nitrogen
(3) Vulcanized properties at 20' and 60' cures.

systems were accordingly chosen, following the Shelton and McDonel evidence (12), as being representative of a polar, a mixed polar-free radical, and a pure free radical mechanism.

Tests for the heat-treated ISAF (Statex 125) carbons in SBR 1710 with the three curative systems are given in Table 2. The corresponding results in natural rubber are presented in Table 3. Results for the EPC (Micronex W-6) carbons in both polymers with the Santocure recipe are set forth in Table 4.

In all curing systems in both polymers the heat treatment steps apparently have little effect on time to optimum cure although a slight retarding action is observed with the graphitized carbon in the Santocure system. In fact there was no indication of a carbon black-curative interaction in any of the curative systems based on the observed vulcanizate properties. Significant changes in the properties of SBR 1710 and natural rubber vulcanizates containing the ISAF carbon after the various heat treatments are presented in Figure 4.

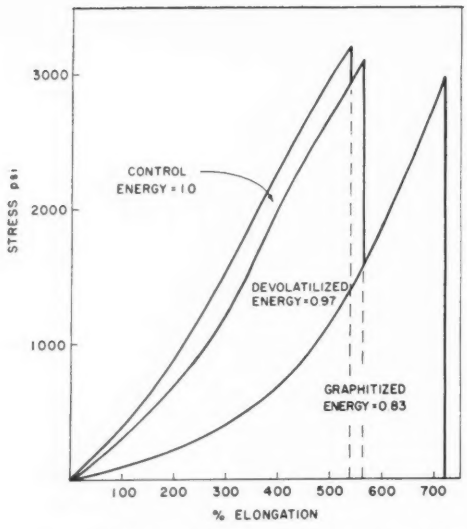


Fig. 5. Effect of heat treatment on ISAF (Statex 125) black on energy of rupture (total area under stress-strain curve with control equal to 100) for an SBR 1710 compound cured with Santocure for 60 minutes at 293° F.

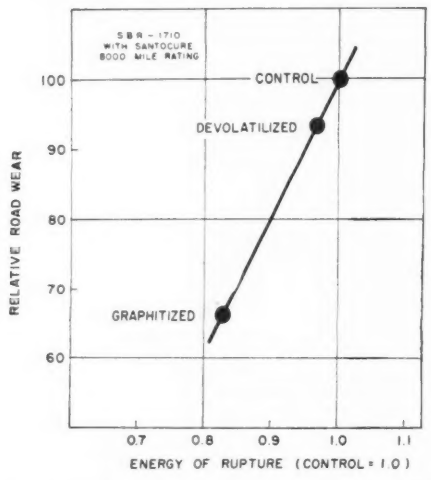


Fig. 6. Effect of heat treatment of ISAF (Statex 125) black on roadwear in SBR 1710-Santocure treads and correlation of roadwear with rupture energy. Roadwear rating after 8,000 miles with control equal to 100

It is apparent that no major loss in reinforcement potential develops in the compounds containing Statex 125 even after it has had almost complete loss of surface oxygen (after devolatilization). The large changes in the properties of the vulcanizates only take place after the crystallite growth and rearrangement process of the ISAF black has taken place (after graphitization).

Those properties generally associated with the chemical interaction of carbon black and elastomers, such as carbon gel content of the unvulcanized stock, modulus, and crosslink density, either show no decrease or only slight increases when chemisorbed oxygen is removed from the surface with no material alteration of the underlying carbon structure (after devolatilization). Tear strength is definitely improved with all three curative systems. The intermediate 1400° F. treatment produced a slight but significant modulus increase. These findings are not in accord with those of previous investigators (13) who showed a steady decrease in modulus with removal of surface oxygen.

Rebound resilience does drop, however, as surface oxygen is removed and drops further as the carbon surface becomes graphitic. It is possible that rebound, in measuring the mechanical hysteresis which primarily occurs at the carbon-rubber interface, is more sensitive to bond strength and that these bonds which replace oxygen linkages on the devolatilized surface are somewhat weaker.

The results for EPC (Micronex W-6) black given in Table 4 show overcure modulus produced by the devolatilized Micronex to increase. A major part of this increase is due to the removal of surface oxygen with a consequent decrease of the cure-retarding effect.

Previous data concerning this effect of devolatilization on the modulus of channel black compounds are conflicting. Two reports (13, 14) stated that channel black modulus decreases; whereas another (15) claims that modulus increases after a similar treatment. It is probable that, apart from the significant cure effect, the effect of oxygen removal on modulus is relatively minor with the direction of change dependent on the type of carbon, the conditions of the treatment, and

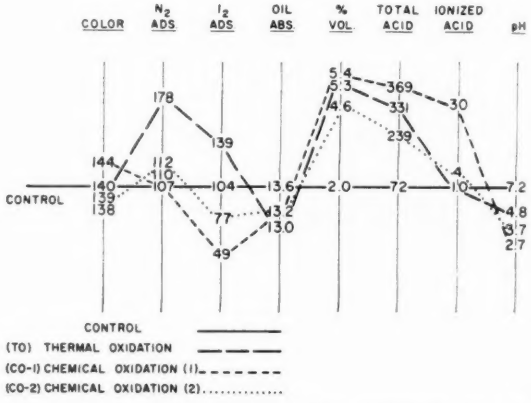


Fig. 7. Effect of various oxidation processes on the properties of ISAF (Statex 125) black

the nature of the original oxygen groups.

The effect of the drastic heat treatment, which leads to partial graphitization, on modulus is well defined, however, as previously observed. This drop in modulus for the graphitized black leads to a significant decrease of rupture energy as determined by the total area under the stress-strain curve (Figure 5). Road testing of SBR 1710 treads compounded with these three blacks gave the results presented in Figure 6, the control at 100 indicating most resistance to wear, as measured by loss of tread (depth) after 8,000 miles of road testing.

These roadwear results show a striking correlation

with the energy of rupture. Again, a relatively small effect is produced both upon rupture energy and roadwear by devolatilization. Only when the carbon surface itself is altered is a marked effect produced. The wear performance of the graphitized black, at 65% of the control, which checks well with previous findings (13) must be attributed to physical bonding only since chemical bonding has been completely eliminated. It is this combination of physical and chemical bonding that distinguishes carbon black as a superior reinforcing pigment in rubber.

Addition of Chemisorbed Oxygen

Oxidation of the surface of the ISAF (Statex 125) black was carried out by three methods in order to develop differences in the kind of oxygen functional groups at the same total combined oxygen level. These differences in kind of groups should, it was felt, bring out differences in the nature of the interaction with the polymer provided the type of oxygen functional groups was a significant factor.

The first oxidation treatment was carried out by thermally heating the carbon in air at a temperature of 750° F. for 1½ hours. The two chemical oxidations were carried out under conditions required to add substantially the same amount of oxygen to the carbon surface as the thermal treatment.

TABLE 5

PROPERTIES OF OXIDIZED STATEX 125

Oxidation	None	Thermal (1)	Chemical-1 (2)	Chemical-2 (3)
Properties				
Color (4)	140	139	144	138
Tinting Strength (4)	116	112	116	114
Oil Absorption (4)	13.6	13.0	13.2	13.2
N_2 Adsorption (4)	107	178	110	112
I_2 Adsorption (4)	104	139	49	77
% Volatile	2.0	5.3	5.4	4.6
pH	7.2	4.8	2.7	3.7
Total Acid (4)	72	331	369	239
Ionized Acid (4)	1	1	28	4

(1) Thermal oxidation
(2) Chemical oxidation - process (1)
(3) Chemical oxidation - process (2)
(4) See footnotes under Table 1.

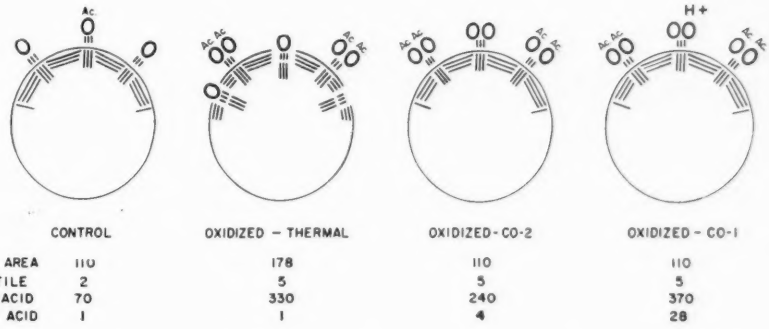


Fig. 8. Schematic diagram of ISAF (Statex 125) black before and after various oxidation treatments, showing number and nature of oxygen functional groups. ("Ac" indicates acidic oxygen functional group)

The effects of these treatments on the physical and chemical properties of the black are shown in Table 5 and Figure 7. The tinctorial, absorption, and adsorption results indicate little change in the surface area and structure of the chemically oxidized carbon although thermal oxidation significantly increased the area, as shown by the nitrogen and iodine adsorption data in Table 5. Again, particle diameter, as estimated by electron microscope examination, was unchanged. The properties associated with added oxygen were, however, changed significantly. At substantially the same oxygen volatile level these treatments developed significant differences in pH, total acid, and ionized acid, indicating unquestionably marked differences in the nature of the oxygen functional groups. A schematic picture of the variations in the makeup of these groups is presented in Figure 8.

The thermal treatment and the CO-2 (chemical oxidation—second method) treatment developed oxygen groups of essentially the same type. Total acid was increased on both over that in the control. ("Ac." in Figure 8 indicates an acidic oxygen functional group.) The only difference lies in the increased porosity indicated for the thermal treatment, as evidenced by the higher nitrogen adsorption results in Table 5. The CO-1 (chemical oxidation—first method) treatment produced both more acidic oxygen groups as well as much more ionizable hydrogen than the other two treatments.

Effect of Added Chemisorbed Oxygen on Rubber Properties

This series of oxidized ISAF carbons was tested also in two polymers (SBR 1710 and natural rubber) with the same curative systems (DPG-sulfur, Santocure-sulfur, and Dicup), with the summarized results for SBR 1710 given in Table 6 and the more significant results presented graphically in Figure 9.

It is apparent that except for the expected retardation of cure rate for the DPG and Santocure recipes caused by the oxidized blacks, only minor changes in vulcanizate properties were produced by the differences in the type of oxidation (see 90-minute cure data in Table 6). Results in the dicumyl peroxide system, in which vulcanization has been stated to proceed by a free-radical mechanism, differed in several respects from those in the other two systems, and this point was especially true of cure rate and modulus. As expected, the oxidation treatments had a decisive effect on the cure rate in the sulfur systems with SBR 1710, as shown in Table 6 and Figure 9. In the case of the dicumyl peroxide systems there was little effect on cure with SBR 1710 (Table 6) and no effect with natural rubber (Figure 9).

mastication which partially or completely saturates the adsorption sites. The presence of different antioxidants in SBR 1710 and natural rubber is a complicating factor, especially marked in the peroxide cure system, which may alter the action of the carbon black.

The oxidized carbon black-peroxide interaction observed in natural rubber and cure rate is also found with crosslink density and modulus. These effects are in the expected direction, i.e., in natural rubber-peroxide cures crosslink density is unaffected by added oxygen, while the level falls off for the other combinations, and the same is true for modulus, as shown in Figure 9. In the case of crosslink density and modulus the effect is slightly greater for the CO-1 treatment which produces a generally more polar surface. The slightly decreased tensile produced by the oxidized carbon in the natural

TABLE 6

RUBBER PROPERTIES OF OXIDIZED STATEX 125 CARBONS IN SBR-1710 WITH 3 RECIPES

Recipe	DPG				Santocure				Dicup			
Oxidation	None	Thermal	Chem-1	Chem-2	None	Thermal	Chem-1	Chem-2	None	Thermal	Chem-1	Chem-2
Vulcanized Properties (Cured at 293°F)												
Optimum Cure (1)	35'	60'	60'	60'	30'	40'	55'	55'	25'	25'	30'	30'
20' L-300	450	120	90	120	1025	350	50	70	900	670	725	600
20' Tensile	2280	650	530	590	2560	1350	325	440	2250	2100	1930	1950
90' L-300	1620	1175	960	1125	2430	2190	1800	2350	-	2150	1800	1820
90' L-500	-	2540	2200	2480	-	-	-	-	-	-	-	-
90' Tensile	3000	2830	2660	2850	3040	3100	3080	3050	2440	2520	2630	2620
90' Elong.	475	535	550	545	355	395	445	365	250	340	390	400
90' S.H.	61	59	59	60	65	63	62	66	61	57	56	56
Log R	3.2	3.2	4.9	3.9	3.0	3.2	5.1	3.7	3.1	2.8	5.2	4.0
Rebound	46.4	43.7	45.1	44.6	50.6	50.1	52.0	52.5	59.5	56.9	57.9	58.4
Dispersion (Visual) (2)	7.5	8.0	7.5	7.5	7.5	7.8	7.8	7.8	7.0	7.5	6.8	6.8
Dispersion (Mic.) (3)	99	99	99	99	99	99	97	99	98	97	97	97
Crescent Tear (4)	199	210	205	199	185	201	172	138	48	82	92	99
De Mattia Flex (5)	3.6	4.5	6.5	5.2	1.8	2.9	3.0	1.3	1	2.5	8.7	8.8
Crosslink Density (6)	129	111	90	98	196	174	138	165	137	117	109	107
Unvulcanized Properties												
Mooney Visc. (7)	57.5	60.0	65.0	60.0	62.5	64.0	67.0	64.0	68.0	66.0	75.0	69.0
Mooney Scorch (8)												
5 Units	4.0	6.9	6.7	6.6	8.9	11.8	11.5	12.3	3.0	2.8	2.6	2.3
35 Units	6.7	13.8	14.7	13.5	10.8	15.4	17.8	17.9	4.2	4.3	4.4	4.4
Carbon Gel (9)	28	29	28	27	31	31	29	31	34	30	32	31

(1) Estimated from Scorch and Stress Strain results
(2) Rating on torn surface
(3) % Below 9 microns
(4) Tested at 212°F., at 100% overcure (lbs/in)
(5) KC to 50% failure (pierced groove) at room temp.
(6) x 10^6, moles/cc.
(7) ML-4-212°F.
(8) ML-293°F.
(9) % insoluble rubber

These cure effects have several implications. First, some confirmation is given to the polar mechanism of sulfur vulcanization. The more polar surface of the oxidized carbons can be regarded as an ion trap and act to terminate the crosslinking reactions through ion adsorption on the carbon surface, in the same sense as the quinones and hydroquinones are used as free radical traps by Shelton and McDonel.

Concurrently with the increase in polarity of the carbon surface produced by adding chemisorbed oxygen, the ability of the carbon to adsorb and inactivate free radicals is also increased. This ability has been observed both directly and indirectly in numerous instances and may account for the slight cure retardation of the SBR 1710 peroxide system by the oxidized carbon as shown in Table 6. The lack of cure retardation observed in the natural rubber-peroxide system (Figure 9) may result from increased free-radical adsorption during rubber-peroxide curative system is associated with a reduced degree of carbon dispersion.

Modulus Via Structure and Surface Chemistry Effects

On the basis of data presented in the preceding sections of this paper, together with other available data not covered in this paper, it is of interest to assess the role of carbon structure and surface chemistry in the development and control of modulus. It has been shown that modulus can be reduced drastically by destruction of all chemical activity on the carbon particle surface (via graphitization treatment), even though particle size and structure are relatively unaffected. This result would indicate that the presence of normal surface chemical activity is required for structure to maintain its role in modulus development. Also, it has been shown that

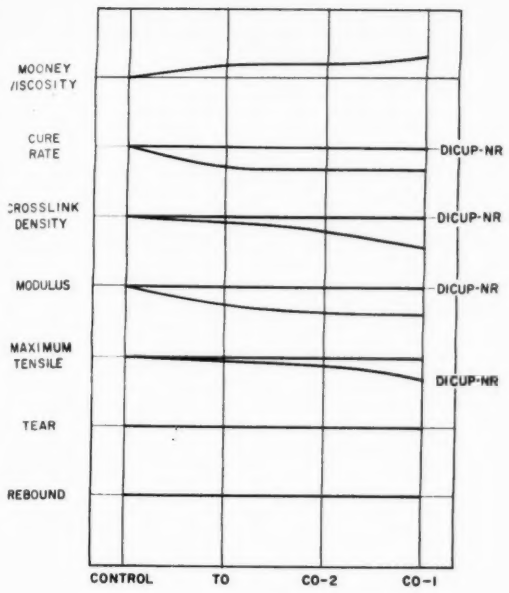


Fig. 9. Effect of oxidation treatment of ISAF (Statex 125) black on properties of SBR 1710 and natural rubber compounds cured with DPG, Santocure, and Dicup. Unlabeled lines are averages for sulfur cures in natural rubber and sulfur and Dicup cures in SBR 1710. Mooney viscosity line is average for all natural rubber and SBR compounds

added oxygen volatile to the carbon surface (via various oxidation treatments) will drastically reduce modulus by a cure effect, even though particle size and structure are unaffected.

Another approach to the lowering of modulus is by reduction of the structure level of the carbon, either with or without an attendant change in the surface chemistry. Recently furnace carbons, with lowered structure for decreased modulus, but with normal surface chemical activity, have been developed via a furnace process in the HAF, ISAF, and SAF ranges of fineness. The Columbian Carbon grades corresponding to these ranges are identified as Neotex 100, Neotex 130, and Neotex 150, respectively. It is also possible to reduce structure by mechanical means, such as by ball milling. This method is accompanied, however, by an increase in volatile with a resultant decrease in the rate of cure; the resultant modulus decrease then is due to both structure and volatile changes.

These various means for the lowering (or the control) of modulus, in the polymers employed in the work reported in this paper, as well as others not included in this paper, can be presented graphically, as in Figure 10. It is noted that two of the approaches involve surface chemistry effects with no change in structure; whereas two involve basically structure effects with no change in surface chemistry in one instance. In the case of the graphitized black the effect of structure (as measured by oil absorption shown to be equal to that of the ISAF control) is negated by the complete destruction of surface chemical activity (as shown by the almost complete absence of volatiles)—in the case of the oxidized black the effect of structure is overwhelmed by the drastic retardation of cure. In the case of furnace-processed Neotex 130, the decrease in modulus is due exclusively to the reduction in structure, since volatile levels and cure rate are unchanged—in the case of the detritioned black (ball milled) the greater decrease in modulus is due to the combined effect of lowered structure and measurable cure retardation. In summary, although these four process means are available for controlling the modulus level of reinforcing carbons, the preferred approach would appear to be the furnace process, since it involves no secondary processing step and provides the desired modulus at the cure and reinforcement level of the control.

Summary and Conclusions

1. The removal of chemisorbed oxygen from channel black and furnace black, without alteration of the underlying carbon surface, as by devolatilization, results in only minor effects in reinforcement potential regardless of the curative system employed, whether polar or free radical.

2. When the underlying carbon surface is changed by heat treatment to a state of lower energy, as by graphitization, a significant decrease in the reinforcing ability of the carbon black results.

3. Significant differences in the chemistry of the oxygen functional groups added to the carbon surface, developed by employing widely different oxidation treatments, do not result in any measurable differences between these carbons in terms of rubber properties.

4. The only significant effect in rubber of carbons with oxidized surfaces is to retard cure rate when sulfur curing systems are used. When peroxide curing systems

(Continued on page 90)

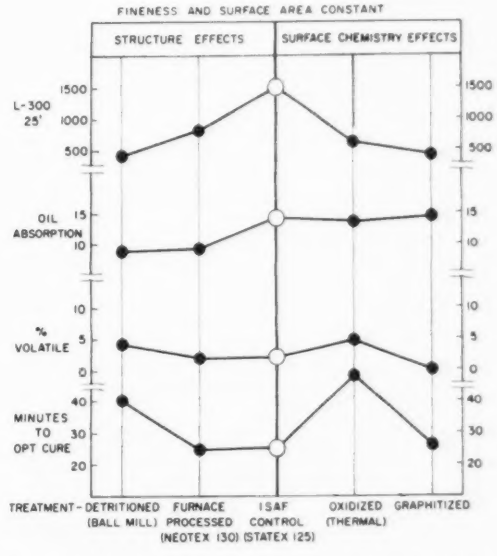


Fig. 10. The role of structure and surface chemistry on control of the modulus of compounds that contain modified forms of ISAF carbon black

Available Styrene-Butadiene Resins

A complete listing of S/B resins available in the United States and Canada, including coprecipitated SBR latices with S/B resin latices for use in reinforcement of rubber and in paints and enamels

THIS list of high styrene resins is the second of a series of articles listing available rubbers and resins, both dry and latex, which will be featured by RUBBER WORLD as a convenience to compounders.

ABBREVIATIONS FOR STYRENE-BUTADIENE RESIN TABULATION

Abbrev.	Description
Al	Alum
Bd. Sty.	Bound Styrene
C	Cold Rubber
Coag.	Coagulation
DAG	DEWEY & ALMY CHEMICAL DIV., W. R. GRACE & CO.
Emul.	Emulsifier
FA	Fatty Acid Soap
FS	FIRESTONE SYNTHETIC RUBBER & LATEX CO.
GA	Glue Acid
GC	B. F. GOODRICH CHEMICAL CO.
GT	GOODYEAR TIRE & RUBBER CO.
H	Hot Rubber
MC	MARBON CHEMICAL DIV., BORG-WARNER CORP.
MV	Mooney Viscosity (ML 4 min. @ 212° F.)
NC	NAUGATUCK CHEMICAL DIV., UNITED STATES RUBBER CO.
NS	Non-Staining
PO	POLYMER CORP., LTD.
RA	Rosin Acid Soap
SA	Salt Acid
S/B	Styrene-Butadiene Ratio
SC	SHELL CHEMICAL CO.
Spec.	Special
SS	Slightly Staining
ST	Staining
Stab.	Stabilizer
Sty.	Styrene
XF	XYLOS RUBBER CO., DIV. of FIRESTONE TIRE & RUBBER CO.

The first listing of the series covered the SBR dry polymers; this second list contains styrene resins, and next month's issue will carry a list of all the synthetic rubber latices on the market. In future issues listings of other dry synthetic rubbers will be included.

These listings were compiled during the research on materials for the third edition of the "Blue Book" or "Compounding Ingredients for Rubber," which will soon be published. The lists will be included in that book, but are printed here for added convenience and distribution.

The editors would like to acknowledge the great amount of help in compiling these tables that was obtained from tentative lists furnished by C. A. Carlton, J. M. Huber Corp., which were used as style guides and check lists when contacting the suppliers for up-to-the-minute information on grades and technical descriptive information. The fine cooperation of the suppliers in furnishing information is also gratefully acknowledged.

COMING NEXT MONTH

The next in this series of material tabulations which will contain the listings of all synthetic rubber latices including Acrylic, SBR, CR, Fluorocarbon, IIR, and NBR latices.

This classification of materials is made from the same basic raw materials as SBR elastomers, but with a higher ratio of styrene to butadiene. There is some question as to where the break should be made between SBR and resin, but, in general, the division is made at the 50/50 ratio. There are a few grades at approximately this ratio. Most products, however, fall into quite lower styrene content for the SBR's and quite higher for the resins in this list.

A somewhat recent development has been made in which an SBR latex and a resin latex are coprecipitated during manufacture to provide a rubber-resin masterbatch for ease in handling and processing. These materials might very well be segregated into a separate classification of their own. We have included these nine products in this resin list for the time being, however, to keep them handy for comparison and because the number of separate lists could become quite large if too many individual types of material are separated.

The major use for these S/B resins in rubber compounding is for reinforcement. The resins are compatible with most rubbers over a wide range of blend proportions. Benefits derived from use of these ingredients include increased hardness, an increase in stiffness, and increases in abrasion resistance, flex life, tear resistance, and heat aging. Some additional good features include low water absorption and good electrical properties, and these resins act as processing aids in extrusions or in calendering operations. The resins may

Styrene-Butadiene Resins

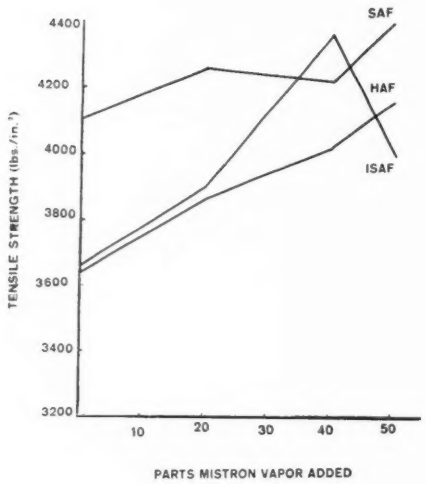
Code No.	Type	MV	Stab.	Emul.	Coag.	S/B Ratio	% Bd. Sty.	Producer	Description
Butaprene									
SL	H	High	SS	FA				XF	High sty. for maximum stiffness
SL-1	H	High	SS	FA				XF	Lower flux temp. for easier incorporation in rubber
FR-S									
158	C		NS	FA/RA	SA		55	FS	50/50 FR-S 1502 and sty. resin coprecipitated as latices
Copolymer									
3	H	50*	ST	[redacted]		70/30		DAG	Medium sty. for easy blending
Darex									
40	C		NS	FA/RA	Spec.		55	DAG	50/50 SBR 1502 and sty. resin coprecipitated as latices
43G	H	60*	NS	FA/RA		85/15		DAG	General-purpose resin
Good-rite									
2007	H	High	None	RA	Spray-dried		85	GC	General-purpose resin
2057	H&C	55	NS	FA/RA	SA		57	GC	50/50 Ameripol 1502 and Good-rite 2007 coprecipitated as latices
Hycar									
2001	H	68	SS	FA	SA		50	GC	Formerly Hycar OS-10
Kralac									
A-EP	H	High	NS	RA	Acetic acid		85	NC	General-purpose resin
H								NC	Rigid sty. resin
Kryflex									
252	C		NS	FA	SA	40/60		PO	Lower sty. than Polysar SS-250
Marbon									
1100-TMV	H	High	None	FA/RA	Spec.		85	MC	Soluble type for paints and enamel
8000	H	High	None	FA/RA	Spec.		90	MC	Maximum reinforcing resin
8000A	H	High	None	FA/RA	Spec.		85	MC	Lower flux temp. than 8000
8000AE	H	High	None	FA/RA	Spec.		85	MC	Electrical grade of 8000A
8000E	H	High	None	FA/RA	Spec.		90	MC	Electrical grade of 8000
QBX-1		58	NS	FA	GA			MC	67/33 OE-SBR and resin masterbatch. Naphthenic oil in SBR
QBX-1E		58	NS	FA	GA			MC	Electrical grade of QBX-1
Naugapol									
K-50								NC	50/50 Naugapol 1503 and Kralac A-EP. Electrical grade
KO-50								NC	50/50 Naugapol 1708 and Kralac A-EP. Electrical grade
Pliolite									
RMB 224A	C	Med.	NS	FA	SA			GT	50/50 intermediate MV SBR and resin with all FA emulsifier
S-3	H	High	None	RA	AL		85	GT	Rubber-grade resin
S-5	H	High	None	RA	AL		86	GT	Grades A, B, C, D, and milled of high to low viscosity. Binder for coatings
S-6	H	High	None	RA	AL		90	GT	Maximum reinforcing resin
S-6-B	H	High	None	RA	AL		82.5	GT	Lower flux temp. than S-6
S-6-E	H	High	None	FA	AL		87	GT	Electrical-grade, easy-processing resin
S-7								GT	Toluene solution of copolymer resin
Polysar									
SS-250	C		NS	FA	SA	50/50		PO	Medium sty. In bale or flake form
Shell									
SP-102	C		NS	FA/RA	SA			SC	Masterbatch of S-1502 and sty. resin
SP-103	C	46	NS	FA/RA	SA			SC	Masterbatch of S-1509 and sty. resin

*ML-4 @ 250°F.

(Continued on page 90)

Talc-Black Combination Gives Im

Tests indicate combination produces better properties than either pigment alone



Tensile strength increases with additions of Mistron Vapor

A COMBINATION of talc with furnace blacks will improve the physical properties of SBR rubbers more than using either furnace blacks or talc alone, according to tests made by Sierra Talc Co., South Pasadena, Calif.

Two types of tests were made: One used a set loading of filler composed of carbon black and talc in various ratios, from 60 parts of black per hundred of rubber and no talc to 75 phr. talc and no black. The other used 45 phr. of black throughout and added to it from 10 to 50 parts of talc.

Two Types of Tests

In the first type of test, tensile strength and ultimate elongation were improved as talc was added and black reduced, reaching an optimum when the amounts of black and talc were roughly equal. Addition of talc, however, generally produced poorer compression set, modulus, tear resistance, and Shore A hardness.

In the second type, addition of talc to the normal loading of black gave improvement in all physical properties except ultimate elongation, which was sharply reduced.

Inclusion of talc in both types of tests greatly reduced optimum cure time while giving a good cure plateau. It also lowered Mooney viscosity, heat buildup, and nerve of the compound, the company reports.

Test results are outlined in Bulletins 27, 28, 29, and 33, published recently by the company and available from Sierra Talc on request. Tests were made with Mistron Vapor, the company's trade name for its ultra-fine magnesium silicate (talc).

Three Blacks Used

In the first series of tests, three different masterbatches were used. One was Shell OB-113C, consisting of 100 parts S-1500 polymer, 52 parts HAF black, and 10 parts Dutrex 20 oil. The second was Shell OB-102, containing 100 parts S-1500 polymer, 60 parts ISAF black, and 10 parts Dutrex 20 oil. The third was Philprene 6604, containing 100 parts S-1500 polymer, 40 parts SAF black, and 5 parts process oil.

For the first two the compound was as follows:

	Ratio of Black/Mistron		
	100/0	80/20	60/40
Masterbatch	162.0	129.6	97.2
Zinc oxide	5.0	5.0	5.0
Stearic acid	2.0	1.8	1.6
Sulfur	1.75	2.0	2.25
Altax	1.50	1.30	1.1
Shell SBR-1500	—	20.0	40.0
Mistron vapor	—	15.0	30.0
Triethylene glycol	—	0.7	1.4
Aminox	1.0	1.0	1.0

	Ratio of Black/Mistron			
	50/50	40/60	20/80	0/100
Masterbatch	81.0	64.8	32.4	—
Zinc oxide	5.0	5.0	5.0	5.0
Stearic acid	1.5	1.4	1.2	1.0
Sulfur	2.38	2.5	2.75	3.0
Altax	1.0	0.90	0.70	0.50
Shell SBR-1500	50.0	60.0	80.0	100.0
Mistron vapor	37.5	45.0	60.0	75.0
Triethylene glycol	1.8	2.1	2.8	2.5
Aminox	1.0	1.0	1.0	1.0

For the Philprene masterbatch the compound remained the same except that the amounts of Philprene were 145, 116, 87, 72.5, 58, and 29 phr.

Tensile Strength Improves

For the three blacks, cured at 280° F., maximum tensile strength in pounds per square inch was as follows:

	Ratio of Black/Mistron			
	100/0	80/20	60/40	50/50
HAF	3,640	3,870	4,020	4,170
ISAF	3,660	3,900	4,370	4,000
SAF	4,100	4,260	4,220	4,400

	Ratio of Black/Mistron		
	40/60	20/80	0/100
HAF	4,220	4,170	3,970
ISAF	4,250	3,630	3,970
SAF	4,240	4,080	3,970

Improved Reinforcement of SBR

For all three blacks, modulus decreased at 300% with substitution of Mistron. At 600%, modulus of HAF and SAF decreased, but modulus of ISAF peaked at 60/40 ratio.

	Ratio of Black/Mistron			
	100/0	80/20	60/40	50/50
300%				
HAF	1,450	1,360	1,235	1,180
ISAF	1,960	1,580	1,480	1,310
SAF	1,130	1,105	938	922

	Ratio of Black/Mistron		
	40/60	20/80	0/100
HAF	1,060	860	711
ISAF	1,190	863	711
SAF	852	842	711

	Ratio of Black/Mistron			
	100/0	80/20	60/40	50/50
600%				
HAF	3,475	3,460	3,400	3,340
ISAF	3,500	3,660	3,980	3,820
SAF	3,260	3,260	2,810	2,840

	Ratio of Black/Mistron		
HAF	3,230	2,770	2,350
ISAF	3,560	2,940	2,350
SAF	2,700	2,630	2,350

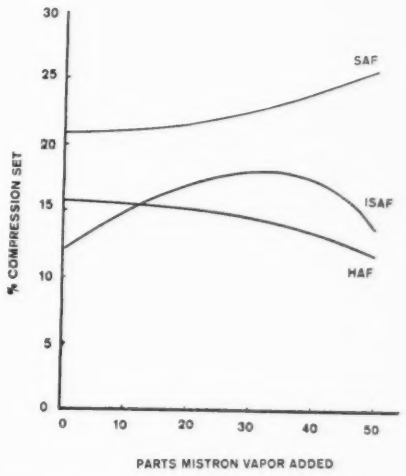
Compression Set

For SAF and ISAF, substitution of Mistron increased compression set values over those for all-black stock. For HAF, on the other hand, compression set dropped to a low at the 50/50 ratio, then increased again.

	Ratio of Black/Mistron			
	100/0	80/20	60/40	50/50
HAF	15.7	15.0	13.7	11.6
ISAF	12.2	17.0	17.6	13.7
SAF	20.9	21.7	24.4	25.9

	Ratio of Black/Mistron		
	40/60	20/80	0/100
HAF	13.9	17.3	22.8
ISAF	16.5	18.8	22.8
SAF	21.8	21.0	22.8

Both SAF and HAF showed marked increase in Shore A hardness with substitution of Mistron, and ISAF showed a slight decrease. All three blacks showed a sharp decrease in tear resistance as Mistron was substituted. Mooney viscosity dropped off as Mistron was substituted, and cure time for HAF went from 120 minutes all black to 20 minutes all-Mistron; for ISAF, 140 minutes to 30 minutes; and SAF, 160 minutes to 20 minutes to obtain maximum cure.



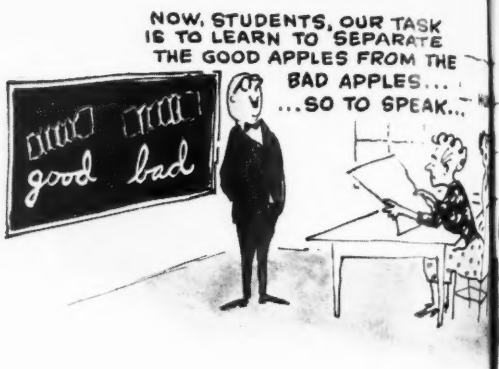
The effect on compression set of adding Mistron Vapor to selected carbon blacks differs with the black. SAF and ISAF compounds show general increase; while HAF compound decreases

In the second series of tests, the same experiments were run on ISAF/talc mixtures alone, using three different levels of black, 50 phr., 75 phr., and 100 phr. Results were similar to those of the previous tests, with best results occurring at the 50 phr. level and a 60/40 ratio of black to talc.

In the third series of tests from 10 to 50 parts of Mistron vapor were added to a compound containing 40 parts of SAF black, the same masterbatch as used in the first series of experiments. The results were improvements in everything but ultimate elongation, which dropped, and tensile strength, which peaked at 10 parts Mistron.

	Parts of Mistron Added					
	0	10	20	30	40	50
Tensile, psi.	4,120	4,355	4,220	4,030	4,000	3,860
Modulus						
300%	996	1,140	1,195	1,200	1,330	1,390
600%	2,860	3,190	3,280	3,250	3,550	3,590
Shore A hardness	56	59	60	62	65	66
Compression set	21.6	23.2	21.6	21.7	20.0	19.7
Tear resistance	326	359	340	343	354	342

NOTE: Rubbers and rubber chemicals used in test compounds, and their suppliers, are: Shell OB 113C and OB-102 masterbatches, Shell Chemical Co.; Philprene 6604 masterbatch, Phillips Chemical Co.; Altax, accelerator, R. T. Vanderbilt Co.; triethylene glycol, activator recommended by Sierra for use with talc, Dow Chemical Co.; Aminox, antioxidant, Naugatuck Chemical Division, United States Rubber Co.; Dutrex 20 oil, plasticizer, Shell Oil Co.



Training Inspectors for Quality Control

A VARIETY of plans may be set up to train personnel for a quality-control program. Which one is best suited to a particular company depends on the jobs to be filled in carrying out the quality-control program. This in turn depends on both the long-term and short-term objectives of the program and the plan devised to carry them out.

There are, of course, a number of elements in a quality-control program besides personnel. These elements, all equally important and interrelated, include competent management practices; types of test equipment, measuring equipment and laboratory equipment; quality-control methods, including control and sampling procedures, and setting up realistic and understandable standards and specifications for materials.

The main element to be considered here, however, is personnel, and this breaks down into two categories: jobs to be filled, and background of personnel to fill them.

Two distinct groups are involved in quality-control programs, inspectors and laboratory technicians on the one hand, and supervisors and quality engineers on the other. These groups require different types and levels of training.

The Training Program

The program to be discussed is for training of quality-control inspectors and technicans. There are a number of papers on the subject of training supervisors and engineers. In the case of the quality-control inspectors and technicians, since there may be considerable variation in education, both the training program and the tests used to pick trainees may be varied according to the background of the persons involved.

A specialized training program for quality-control inspectors should enable those trained to carry out their duties rapidly and well with a minimum of supervision. An inspector must know quality-control procedures, must understand and properly interpret quality standards, must use measuring equipment, must keep accurate records, and must report production of off-standard materials so that corrective action can be taken.

It is expected that an inspector completing such a course would attain the same level of responsibility as a production-floor foreman, and that the inspector would complement the foreman. In addition, the inspector would be able to assist the quality-control supervisor and educate the production operators in meaning and interpretation of quality standards.

An individual may be trained by resolving on-the-job problems under the guidance of a supervisor. He may also be left to his own initiative to attend outside classes and study reference books if he wishes. Neither method guarantees that the individual will receive any given amount of training, however, and neither will accomplish the results as rapidly as a company-sponsored classroom training program.

Since speed is essential in developing the trained persons necessary to install a new program, the most logical approach is a company-sponsored training program which concentrates on immediate company needs.

Course Content

The problem can be considered twofold: New or untrained employes must learn inspection methods from the beginning, and employes trained through experience in older procedures must now be retrained in the new methods to be applied.

The content of the training course will depend on:

1. Experience and educational background of persons to be trained.

LOST FOUR BUT I GAINED SIX...
MEETCHA FOR LUNCH?
WHAT DID HE SAY ABOUT APPLES?
WHAT'S HAPPENING?
WHAT TIME DO WE GET OUT OF HERE?
LIKE IT?
I WAS A QUALITY CONTROL INSPECTOR WHEN HE WAS IN DIAPERS...
MEEEOW
BOOTS

One rubber products plant did job in three weeks, holding classes for picked workers an hour a day

By T. E. SHAHNAZARIAN

Service Bureau Corp., New York, N. Y.

2. Type and complexity of products and processes involved.
3. Type of quality-control program to be installed.

I would now like to discuss an actual training program developed for a medium-sized rubber products manufacturing company. In this company, as in most companies which have approved a new quality-control program, the new program resulted in an expansion of patrol inspection and outgoing sampling inspection.

This required that existing quality-control personnel be taught the new concepts and procedures, and that those unable to grasp the fundamentals of the new techniques be transferred to other operating departments.

It also required that additional persons be selected and trained to bring the number of inspectors up to the requirements of the program. Generally it is best to obtain these trainees from among present employes if possible.

In the company under discussion, patrol and sampling inspection required only women hourly workers. A girl was qualified for training as an inspector if she was proficient in arithmetic and in reading scales and had initiative. The problem was to decide prior to training whether the girl had these qualifications. This was more difficult in the case of new employes, whose abilities were unknown, then in the case of older employes.

Tests To Pick Trainees

Evaluating these qualifications by personnel interview alone was not considered sufficient, since a variety of objective tests can be employed to evaluate potential inspectors. These include:

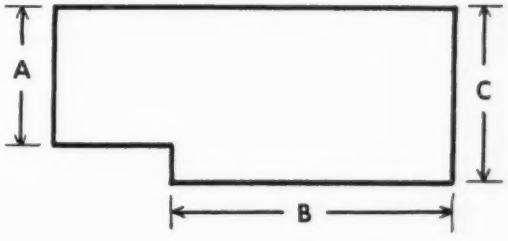
1. Flanagan's Aptitude Classification Test.
2. Thurston Test for Mental Alertness.
3. Science Research Associates Clerical Aptitudes.
4. Science Research Associates Mechanical Aptitudes.

All four tests are available from Science Research Associates, Chicago, Ill. The tests evaluate the applicant's abilities in inspection, memory precision, arithmetic, mental alertness, clerical ability, and mechanical aptitude. I felt that the tests and those similar in nature were good indices. They were, however, considered too complex for the women to be tested, since most of them did not have high school diplomas.

The solution was design of the "Quality Control Personnel Test." Twenty minutes was the maximum time allotted for completion of the entire test. A few sample questions are shown below.

QUALITY CONTROL PERSONNEL TEST

1. Measure the dimensions A, B & C in the drawing below:



2. Solve the following:
   (a) $\frac{7}{8}'' - \frac{1}{2}'' =$
   (b) $\frac{1}{64} + \frac{3}{32} =$
3. Count the letter Z each time it appears before F in the problem below:
   SEYZFSYFZFFSYSZFEZFZYFZFYZFYSSFEZFYFZS-EEZEZEYZFYZEZFS

The Author

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4. If the following words were seen by looking at their reflection in a mirror on the opposite wall, which word would appear exactly the same if seen directly?
(1) MOON (2) DEED (3)YOYO (4) WOW (5) OK

Experience with the "Quality Control Personnel Test" in several companies has been extremely encouraging. About 40% of potential trainees failed the test, and the 60% passing and entering the training program had little trouble absorbing the subject matter and became very effective quality-control inspectors.

Another test used by some companies as a supplement to the objective test and personal interview is the "Activity Vector Analysis" test. It is designed to evaluate the intangible characteristics considered necessary for inspectors. (The AVA test is available from Walter V. Clarke Associates, Providence, R. I.)

When To Hold Classes

Following selection of persons to be trained, it is necessary to decide the hours when classes are to be held, the duration of the program, and whether groups other than quality-control personnel should be invited to classes.

In a plant with more than one production shift, there may be problems in scheduling classes. In the case of the rubber plant, women inspectors were employed during the 7:00 a.m. to 3:30 p.m. shift and the 3:30 p.m. to midnight shift. There were several solutions, as follows:

1. Hold two training classes daily, one for each shift of inspectors. This would permit training without hindering manufacturing operations, since classes would be held before or after the shift. The obvious disadvantage is in duplication of training classes, giving two lectures a day when only one should be necessary.

2. Hold a concentrated course on Saturday, a non-business day. The disadvantage here is reluctance of trainees to attend classes on an off-day during a long training session, accentuated in the case of the rubber plant, since training was to be conducted during the summer.

3. Hold training classes daily for one hour during the shift change, from 3:00-4:00 p.m., necessitating that the first-shift trainees remain at the plant half an hour later, and the second-shift trainees come half an hour early, to be paid at overtime rates. The disadvantage was that for a single hour each day during the program, no quality-control personnel would be working in production.

The third approach was selected, and 15 one-hour lectures were scheduled over a three-week period. Production-floor foremen and supervisors were encouraged by the factory manager and quality-control manager to attend classes voluntarily along with the inspectors.

The Course Program

The course program was as follows:

Topic	Session Number
Introduction	1
Review of Arithmetic	2, 3, 4
Use of Measuring Equipment	5, 6
Discussion and Interpretation of Quality Standards	7, 8, 9
In-Process Control Methods	10, 11
Sampling Plans and Their Use	12
Quality Control Records and Charts	13, 14
Final Examination	15

INTRODUCTION. The first session began with a talk by the division manager emphasizing the importance of a quality-control program to the factory, giving the trainee a feeling of purpose in the training program.

The quality-control manager then reviewed the course outline, distributing prepared sheets with the daily schedule and topics to be presented. He outlined the aims of the program and the specific department organization for quality control, listing each of the key persons by name and outlining his responsibilities. The manager then discussed the factory organization, again naming the key persons and listing their duties, and outlined company history.

The quality-control supervisor reviewed the product lines in detail, explaining differences between product groups and between specific products. Copies of product brochures were distributed to trainees for future reference.

REVIEW OF ARITHMETIC. Classes began with an abbreviated review of fractions and decimals, explaining addition, subtraction, multiplication, and division of both fractions and decimals, conversion of fractions to

decimals and *vice versa*, the concept of the least common denominator of a fraction and identification of digit locations of decimals.

Problems of using these techniques were reviewed as applied to determination of dimensional tolerance limits.

Next, trainees were acquainted with the key points of statistical computation: the arithmetic mean, or average; determination of the range; and computing percentages of defective items. In each case the statistic was defined by a simple formula, and its use was explained by solving sample problems, taken from actual plant data. Data on weights of compression molding pills were used to compute average and range, and results of 100% inspection of a lot of mechanical rubber goods used to determine percentage of defectives. Students solving the practical problems were asked to explain their solutions to the class.

USE OF MEASURING EQUIPMENT. The inspector was acquainted with the equipment she would use on the job, which included a rule or scale, Shore durometer, dial indicating micrometer, plug and snap gages, balances, and special template gages.

For each piece of equipment, the instructor explained interpretation of the numerical scale, and use of each measuring instrument. Time was made available so that each student could practice equipment techniques and ask questions if necessary.

DISCUSSION AND INTERPRETATION OF QUALITY STANDARDS. Since a multitude of products was made in the plant, it was difficult to cover the variety of quality standards in use. Therefore the products were organized into classifications, and standards written for each classification in language clear and concise enough to provide guidance for the inspector. Where classification was not feasible, individual product specifications were defined.

Before specific standards were discussed, the instructor explained what product characteristics are, defined defects and defectives, and defined the various levels of defectives: minor, major, and critical.

Written quality standards were reviewed by products within group classifications, and where the standards were complex, examples of defective products were brought into class and compared with the quality standard to determine their deviation from visual and dimensional characteristics set up in the standard.

Following a review of the subject, unmarked product samples were given to individual students for quality testing. Results were discussed in class, and if errors were detected, they were corrected.

IN-PROCESS CONTROL METHODS. Each in-process control planned for the new program was reviewed in detail. Each control was explained for characteristics being controlled and their effect on consecutive operations, results if control was not properly maintained, selections of samples, and corrective actions to be taken by the process inspector if she found that a process was "out of control."

SAMPLING PLANS AND THEIR USES. Before discussing specific sampling plans, (using "Statistical Quality Control," E. L. Grant, Second Edition, McGraw-Hill Book Co., New York, N. Y., as the text) the instructor explained basic concepts of sampling, including lot size, sample size, acceptance number, acceptable quality level, and type of plan, whether single, double, or multiple.

The instructor stressed the need of selecting a truly random sample in evaluating a lot and explained just how taking a sample "from the top of the tote box" would throw off test results.

Trainees then were instructed in reading and interpreting single- and double-sampling plan tables and were given questions on the sample size to be selected and acceptance number required for a given lot size and acceptable quality level.

QUALITY CONTROL RECORDS AND CHARTS. It was necessary to assure trainees that all of the information they recorded would be analyzed daily, weekly, and monthly for quality improvement and for management reports and to assure them that data collection, recording, and analysis were the key to the new quality-control program. This emphasis was necessary because most quality-control inspectors believed that it is pointless to record information, since "the data is never used and it ends up in an incinerator."

Tabulation of variable data was explained, and concepts were presented of both frequency distribution and control charts, together with techniques utilizing these control charts. Practice sessions were used to tabulate actual data collected in the factory.

FINAL EXAMINATION: The final examination, given on a cross-section of all the material presented, was used, to sort out personnel who did not qualify as quality-control inspectors. It was also used, however, to isolate individual weaknesses so that these could be eliminated by self-instruction or under guidance of a supervisor, and to determine future training needs. A sample of the examination is given in the appendix.

It should be emphasized that training needs will vary from plant to plant and from company to company. It should also be emphasized that as times change, as products and processes change, company training programs should be evaluated periodically to make sure that they are still fulfilling the purpose for which they were originally designed and to see whether they cannot be improved in the light of experience.

APPENDIX

Final Examination

1. Determine the length of reference sample No. 1 to the nearest $\frac{1}{16}$ of an inch. The length specification is 42 inches $\pm\frac{1}{2}$ of an inch. Is this part acceptable for the length characteristic?

2. Determine the Shore durometer hardness of reference sample No. 2. If the standard is specified at 65 $\pm$ 3, does the part conform to the specification?

3. The results of 100% inspection of part #13278 are as follows:

Total pieces inspected	1500
Total defectives	249
Reason for defectives:	
Poor fills	135
Excessive flash	100
Others	14

Questions:

a. Determine the total percent defective.
b. What is the percent defective due to "excessive flash."

4. Below are the results of weighing 25 compression molding pills to the nearest 0.1 ounces.

20.4	20.7	20.5	20.3	20.4
20.4	20.2	20.0	20.4	20.3
20.5	20.3	20.1	20.4	20.2
20.6	20.1	20.4	20.3	20.5
20.6	20.4	20.2	20.3	20.5

Questions:

a. Prepare a frequency distribution of results.
b. Determine the arithmetic average of weights.
c. Determine the range of results.
d. If the specification is 20.3 ± 0.3 ounces, how many parts are overweight? How many parts are underweight?

5. Using the attached sampling tables, if a lot of molded parts is presented to final inspection, what sample size and acceptance limits would be utilized, given:

a. Lot size	15,000 pieces
A.Q.L.	2.5%
Type plan	Single sampling
b. Lot size	17,250 pieces
A.Q.L.	0.65%
Type plan	Double sampling

6. Outline the procedure you would follow when a lot of finished material has been rejected as a result of sampling.

7. True or False?
   a. When a part is "soft" (low durometer), it is considered a minor defect.
   b. Using a sampling plan n=50, c=0, if only one piece is defective in the sample, we can still accept the lot.
   c. To measure gasket thickness, $.050 \pm .010$ of an inch, a dial indicator must be used.
   d. If a plug gage (to measure I.D.) goes completely into the hole, the inside diameter is considered acceptable.

8. Visually examine the three samples marked #3, 4, 5, and determine if the parts are defective. Quality standards may be referred to, if required. Complete the form below and determine deviations from standard.

Sample Number	Part Number	Defect Description
3	16352	
4	107A	
5	2732-1	

Chemistry of Carbon Black

(Continued from page 81)

are used, this effect is negligible. In terms of reinforcing ability of the carbon black the presence or lack of oxygen functional groups would seem of little import, at least in the polymers used in this study.

5. The net conclusion to be drawn is that combined oxygen on the carbon surface plays a relatively minor role in the chemical effect of carbon black upon reinforcement; the nature of the carbon surface itself plays the major role.

Acknowledgment

The authors gratefully acknowledge the assistance of their associates in the Columbian Carbon research laboratories in the preparation of the experimental data, and the permission of E. B. Brooks, vice president, Columbian Carbon Co., to publish this paper.

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Styrene-Butadiene Resins

(Continued from page 83)

be used in light-colored stocks and yield stocks with low gravity.

In compounding with these resins two methods may be used. The resin may be substituted for part of the base polymer or it may be added as an addition. A point to note is that the resin does have some unsaturation and may require an adjustment in the accelerator level. The addition of the resin often permits an increased filler loading while retaining the desired hardness.

Major use of these resins is made by the footwear industry where the improved abrasion resistance has produced soles and heels with longer wearing characteristics. The benefits of resin addition have been gained in microcellular soles and in compounds for direct molded footwear as well as in standard molded soling. Other large users include wire and cable insulation, sport balls such as footballs, basketballs, volley balls, and golf ball covers, hard rubber goods such as battery trays, buckets, and seating.

There is little doubt that these resins are very important compounding ingredients and that the new grades and developments should increase their usefulness in many applications.

Neoprene Flooring Fights Disease

Material helps keep animal research labs free from bacteria

Neoprene flooring used in this Lederle Laboratories animal experiment lab in Pearl River, N. Y., withstands the corrosive effects of animal waste materials and stands up under use of germicides and steam cleaning

A SPECIAL neoprene-cement compound used in laboratory flooring is aiding in the battle against disease.

Medical researchers fight a constant battle against the bacteria and viruses which invade their laboratories and upset carefully controlled experiments. The problem is especially acute where live animals are housed for research purposes, as in the Lederle Laboratories at Pearl River, N. Y.

The problem Lederle found in keeping animal research laboratories germ free was that the floor surfaces were constantly contaminated by animal urine and fecal matter, a breeding ground for all types of bacteria and viruses. In addition to the small cracks and crevices in laboratory flooring caused by normal aging factors, the chemical products of animal waste matter tend to wear flooring and create cracking which provides difficult-to-clean hiding places for bacteria.

Flooring Shows Durability

For the past eight years the durability of a neoprene-cement flooring has been demonstrated at the Lederle Laboratories. The flooring, produced by Crossfield Products Corp., Roselle Park, N. J., under the trade name, Dex-O-Tex Neotex, was laid in 1952 in the animal housing sections of Lederle's virus research lab.

According to Lester D. Antoine, administrative supervisor of the Lederle research section, the more than 12,000 square feet of flooring has required a minimum of maintenance, is not affected by animal excrement, and is undamaged by steam cleaning and cleansing with germicidal agents. He says he is "delighted with the performance of the Dex-O-Tex floors." Harold Cole, in charge of the animal section, reports that the neoprene flooring is easy on the feet and legs and is non-slip even when wet.

Joints Eliminated

The flooring is a quarter-inch thick, applied by trowel, and completely free of joints, seams, or cracks. In addition, the flooring is turned up at the walls into an integral cove base, further reducing the problem of joints at the floor level and facilitating cleaning.

The neoprene flooring is just one of the precautions taken by Lederle to keep germs from infecting the more than three million animals which pass through its laboratories every year. Separate air-conditioned plants in each section, refrigerators for animal foods, batteries of incubators and freezers, specially designed windows to help preserve 100% sterile conditions, and a screened outdoor play area for monkeys are among the devices used to protect animals from the danger of infection.

There are no seams or cracks in this neoprene flooring at Lederle Laboratories to harbor bacteria and viruses. The flooring is carried up the wall for a short distance to eliminate a seam at floor level which would be difficult to clean with steam or germicides

Auto Engineers Study Classification Table

A special report to RUBBER WORLD by N. L. Catton

Design engineers can now accurately specify their exact requirements for rubber parts by a new "expanded tubular system." More than 125 engineers heard this new classification system explained at a panel discussion held as part of the International Congress and Exposition of Automotive Engineering at Cobo Hall, Detroit, Mich., January 9-13. A modernization of "Elastomer Compounds for Automotive Applications, ASTM D 735—SAE 10R," the new method will be called "Classification System for Elastomeric Materials for Automotive Applications" and, when adopted by the societies, will bear the numbers ASTM D 2000—SAE 200J.

The panel moderator, N. L. Catton, chairman of Subsection IV-D of the Technical Committee on Automotive Rubber, and assistant manager of neoprene sales, E. I. du Pont de Nemours & Co., Inc., stated that the system is the result of a five-year study by a special group who reviewed available systems including those proposed by the International Standards Organization. Designed to provide for new elastomers and test methods without complete reorganization of the system, the system will include elastomers now in commercial use and not at present covered in ASTM D 735—SAE 10R, such as "Hypalon," urethane rubbers, the fluoro-elastomers, "Viton" and Fluorel, and will describe the improved heat resistant, non-oil resistant compositions made from butyl rubber and the lower swelling and lower set properties available with the W types of neoprene.

R. C. Edwards, Chrysler Corp., emphasized the value of the new system in reducing the cost of preparing and publishing company specifications. He also indicated that it would offer better control through increased physical property tabulations, resulting in economic advantages for the user.

The rubber industry favored the adoption of the method because it would simplify the rubber technologist's job in preparing the specific quality desired to meet the engineer's requirements. J. J. Allen, Firestone Tire & Rubber Co., stated. The Department of Defense, he said, had accepted the new method in principle and planned to issue procurement documents using specific line call-out qualities from the classification system as appropriate for the various procuring departments. He further pointed out that the rubber committee of the International Standards Organization was reviewing the system for possible use as an international standard.

Lubitsh & Bungarz

N. L. Catton

Discussing the system from an automotive viewpoint, J. R. Forrester, Jr., Ford Motor Co., said that not only did it offer qualities not available in the old method, but it was also sound and flexible enough to endure in spite of the continuing additions of new elastomers and industry requirements. He also stated that, although the widespread use of the new method could eliminate the need of company standards, a complete cross-index from the old to the new must be published at first to enable the engineer to make a suitable transition.

As the system seemed to be very complex on first reading, R. C. Waters, General Motors Corp., proposed an educational program to show the engineers the system's use and advantages. He pointed out that as soon as an engineer had studied the system and applied it to several specific examples, the understanding and value of the system became apparent to him.

The major advantages of the new classification system which were brought out in the panel discussion can be summed up as follows: the system will permit a more universally exact specification for materials; it will cover a wider range of materials than the present system; and it will provide for easy inclusion of future materials and test methods. The system will help inexperienced engineers to select practical, commercially available, and hence economical materials to fit their requirements.

Two other subjects which were discussed at the International Exposition concerned the construction, working principles, service life, and recapping characteristics of wire cord tires developed in Europe and America, and a review of current activity in the design and development of disk brakes and anti-skid devices.

Among the exhibitors at the Exposition were Automotive Rubber Co., Inc., Bendix-Westinghouse Automotive Air Brake Co., Borg-Warner Corp., Chicago Rawhide Mfg. Co., Dayton Industrial Products Co., Dow Chemical Co., E. I. du Pont de Nemours & Co., Inc., Enjay Chemical Co., Fawick Corp., Gaylock, Inc., Link-Belt Co., Lord Mfg. Co., Minnesota Mining & Mfg. Co., Monroe Auto Equipment Co., Raybestos-Manhattan, Inc., Shell Oil Co., The Timken Roller Bearing Co., The Torrington Co., and Union Carbide Plastic Co.

New Impact Plastic Family Described

The plus features of polycarbonate resins such as impact strength, glass transition temperature, dimensional stability, electrical properties, and the ability to be self-extinguishing when ignited, were described by Kenneth B. Goldblum, General Electric Co., to the Elastomer & Plastics Group of the Northeastern Section, ACS.

In his talk, "The Chemistry and Properties of Some Polycarbonate Resins," the speaker prefaced his story of the structural characteristics of the various polycarbonates with an historical outline of the early work in this field by Einhorn Bischof and associates, Carothers, and others, with blackboard diagrams of structure and reactions characteristic of each development. The many years' lag between the first discoveries and the present revived interest he attributed to the relatively discouraging reports of these early investigators on the properties of the materials they investigated. The interest of General Electric stemmed from work initiated several decades ago in terephthalates, he explained.

After diagramming the general structure of these phenol-acetone condensation products and showing how spatial relations, substituents, and replacements in the various available positions could alter structure and properties, making virtually limitless numbers of polymers possible, the speaker considered some of the more common starting materials and the effects that some common impurities could cause in the reactions involved. He then discussed three production methods — ester exchange, direct phosgenation, and a method using N,N¹-carbonyldiamidazole.

Included in the above discussion were the chemical reactions, the probable mechanisms involved, the use of small amounts of promoters and catalysts, the effects of solvents on the processes and end results, and the uses of the resulting polymers. These materials are thermoplastic, in general, but the high melt point renders some of them difficult to mold and limits their application, but expands their use.

The major discussion centered on Lexan, G-E's first commercial product, and Goldblum showed numerous colored slides indicating the superiority of the product in impact strength, glass transition temperature, dimensional stability, electrical properties and the self-extinguishing feature. The unusually high impact strength exhibited was attributed to the critical thickness of the test pieces, for below a certain value the material exhibits a "necking-down" before failure, similar to some metals, which affects the value at break.

Data shown indicated the high dimensional stability under a wide range of conditions, and the electrical properties were maintained at high levels up to the softening point, in comparison with lower values, in most instances, for nylon, polystyrene, acrylic and phenolic plastics. Solvent and chemical resistance were also excellent, excepting amines, ammonia, alkalies, some chlorinated solvents (such as methylene chloride, chloroform, and chlorobenzene, which are good solvents for these polycarbonates), and pyridine and p-dioxane.

During the question period, Dr. Goldblum brought out that moisture in molding materials must be kept below 0.01% to avoid foaming which occurs around 0.1%. Contact with water results within weeks or months in hairline cracks, and atmospheric exposure causes discoloration in the surface layer.

The meeting, presided over by Chairman Henry Hill, National Polychemicals, was held on January 17 at Science Park, Charles River Dam, Boston, Mass., with about 75 members and guests present for the preprandial hour, roast beef dinner, and the featured talk.

Chicago Group Party

The Chicago Rubber Group held its annual Christmas party and Ladies Night on December 16 at the Morrison Hotel, Chicago, Ill. A capacity crowd of 942 attended the festivities, which included a cocktail hour, a seven-course dinner, TV and night club acts, and dancing. The ladies received musical alarm clocks as gifts.

Buffalo Group Elects

E. F. Sverdrup, of U. S. Rubber Reclaiming Co., was elected chairman of the Buffalo Rubber Group on December 13. Other officers chosen were: E. R. Martin, vice chairman; E. J. Haas, secretary-treasurer; and R. J. O'Brien, assistant secretary-treasurer, all of Dunlop Tire & Rubber Corp.; and D. E. Schuler, Dunlop Tire; J. Frankfurth, U. S. Rubber Reclaiming, S. Murray, J. M. Huber Corp., F. O'Connor, Linde Division, Union Carbide Corp., C. Peffer, Buffalo Weaving & Belting Co., and R. Lindberg, Union Carbide, directors.

Ontario Group Meets

The Ontario Rubber Group held its monthly meeting, January 10, at the Cloverleaf Hotel, Etobicoke, Ont., Canada. A social gathering preceded the dinner, which 97 members and guests attended. William M. De Crease, supervisor of the elastomer section of the research and development department of Hughson Chemical Co., a division of Lord Mfg. Co., Erie, Pa., addressed the meeting on "The Progress from 1955 to 1960 in Rubber-to-Metal Bonding."

Christmas Festivities

The Ontario Rubber Group held its annual Christmas party on December 6 at Prudhomme's Motel, Vineland, Ont., Canada. James G. Thompson, president of Supertest Petroleum Corp., Ltd., London, Ont., and owner of the unlimited hydroplane, "Miss Supertest III," present holder of the Harmsworth Trophy, showed his own color film of the defense of the Trophy at Picton, Ont., in 1960. More than 120 members and guests attended the cocktail party and dinner which followed it.

NBS Test To Determine Copolymer Composition

The National Bureau of Standards has determined a precise procedure for determining copolymer composition to serve as a basis for refractive index standards. The method, in which the sample is burned to produce water and carbon dioxide, has been used to measure the ratio of bound styrene to butadiene, but could be applied to other copolymers differing significantly in carbon-hydrogen ratio, the Bureau explained.

According to a paper published by L. A. Wood, I. Madorsky, and R. A. Paulson in the March-April, 1960, issue of the *Journal of Research*, National Bureau of Standards, the procedure is precise, but too time consuming to be of value in routine tests.

The copolymer is purified by dissolving the sample and coagulating with methyl alcohol, repeating the process three times. A weighed sample is placed into a Pyrex test tube capped with platinum gauze, in turn placed into a quartz combustion tube heated in an electric furnace. Water formed by combustion is collected in a tube packed with magnesium perchlorate and phosphorus pentoxide, and carbon dioxide is absorbed in a tube containing soda asbestos, magnesium perchlorate, and phosphorus pentoxide. After seven hours' flushing the absorption tubes are weighed to determine the amounts of carbon dioxide and water collected. From the ratios of carbon and hydrogen in the monomers and the ratios in the sample, as determined by the test, the ratio of monomers in the polymer is determined. In four out of five tests the results differed by less than one standard deviation from the theoretical values.

washington report

By JOHN F. KING

TBA Marketing Practices Study Continued by House Committee

The behind-the-scenes fight in the House Small Business Committee over marketing arrangements for tires, batteries, and accessories between the major oil and rubber companies was back in the news as the 87th Congress assembled in January.

The Committee's subcommittee on small business distribution problems struggled vainly in December to write a report on its findings from a series of hearings on the controversial TBA issue in 1960. But opposing forces within the subcommittee forced a draw for the time being. These are led by Rep. James Roosevelt (Dem., Calif.), who believes the oil companies coerce independent oil dealers into buying TBA items from favored rubber companies, and by Rep. William H. Avery (Rep., Kan.), who believes just the opposite.

Despite the volumes of testimony and other evidence collected in long hearings in December and another set held earlier in 1960, the final report could only recommend that the whole problem of TBA marketing be studied further.

Released just at the turn of the year, the report said unanimously that "without prejudicing the individual feelings of any member (of the subcommittee) either for specific legislative remedies or as to the actual conditions existing and being faced by independent business dealers," the subcommittee "should refrain from any substantive conclusions or direct recommendations . . . for immediate legislative remedies."

The report said, however, that it should be allowed to continue its investigations to clarify "conflicting testimony" received during its hearings. This reference is to the fact that bluntly contradictory testimony was offered: that, on the one hand, the oil companies coerced the dealers, and that on the other hand they did not. When these conflicts developed, the charge of perjury was widespread.

The report also expressed hope that further investigation would produce substantive recommendations for legislative remedies to correct a situation where coercion could be proved.

Individual views were appended to the report by both Roosevelt and Avery. The former insisted that "certain destructive and unfair practices exist" in the marketing of TBA and must be corrected to preserve the small, independent service station operator "under the American free enterprise system."

Avery, while conceding there had been conflicts in testimony, sought to analyze them in order to prove in a lengthy section of the report that much of the testimony, conflicting or not, was "irrelevant and immaterial."

Budget Increases for Regulatory Agencies Watched by Industry

President Eisenhower's final budget, that covering fiscal 1962 which he was required to submit to Congress four days before he left office, was widely regarded as an irrelevancy. On closer examination, however, it can be viewed as an open invitation to the Kennedy Administration to push one of the Democrats' traditional pet projects: tougher government regulation of business in all spheres of activity.

The departing Republican chief executive in effect himself proposed a broader approach to government regulation of business—mainly by programming increases in both the funds and personnel of virtually every regulatory agency in the government.

In two key regulatory areas where the rubber industry has had more than a passing interest—the Federal Trade Commission and the Justice Department's Anti-trust Division—large to moderate boosts in operating funds and personnel were requested in the last Eisenhower budget. In the FTC, for example, the ex-President wanted 208 permanent new enforcement officials hired on, a 25% increase. In the Anti-trust Division, he wanted a 10% increase, or 36 new investigators and enforcement officials.

The Eisenhower Administration similarly requested funds to add another 145 jobs at the Securities & Exchange Commission, which regulates corporate financing. At the Internal Revenue Service, it asked for 2,500 new workers on top of the 2,500 added last year. More than 1,000 of these added new jobs would be filled by field investigators.

The Republican President's request for beefed-up regulatory agencies fits in quite nicely with President Kennedy's already announced objective of overhauling these organs of government to make sure they do their jobs of regulating industry. Those 2,500 new Internal Revenue agents, for example, would also fit in nicely with the stated plans of Kennedy's Treasury Secretary, Douglas Dillon. He told the Senate Finance Committee early in January he would have some tax loophole-closing legislative proposals to make before mid-year. Dillon said he will look closest at tightening up on business expense deductions, dividend credits, and tax treatment accorded foreign source income, particularly the foreign oil depletion allowance.

The Rubber Manufacturers Association's Public Affairs Committee met here just before Christmas to exchange views on probable legislative developments in the new Administration and Congress. It decided the big campaign will be waged in three broad areas: business controls, labor legislation, and social welfare measures.

Of specific interest to the industry is the extension of the 52% corporate income tax and the 1¢-per-gallon increase in the federal tax on highway fuels. President Eisenhower urged extension of these taxes which expire on June 30 and added a request for an additional 1¢-per-gallon tax on highway fuels. The Kennedy Administration is expected to adopt these proposals.

Areas of government regulation of business where RMA's Public Affairs Committee smells trouble in the coming session are: legislation requiring corporations to give advance notice of mergers, and a bill giving FTC broader cease-and-desist powers. It also believes there will be bills for the restoration of competitive bidding on federal procurement and a measure to provide access at reasonable rates to patented inventions resulting from federal research contracts.

The Public Affairs Committee intends to issue Public Affairs Bulletins to the industry as the legislative developments occur.

Of greatest immediate concern to the National Tire Dealers & Retreaders Association is the priority label the new Administration has placed on the old Kennedy minimum wage bill. NDTRA is sounding warnings already that it will oppose any tinkering with retail-service exemptions in the wage hour law.

FDA Gets RMA Petition

The Food & Drug Administration will make haste slowly in rendering judgment on the rubber industry's request for a bill of health on a whole catalog of basic materials used in the production of thousands of rubber products produced for the food and beverage industries.

The industry, acting through The Rubber Manufacturers Association, Inc., asked FDA on January 4 for a regulation under the Food Additives Amendment of 1958 declaring that a variety of rubber products made for the food-handling industries is considered safe as long as they are manufactured from an acceptable list of materials and as long as the finished articles meet rigid compounding and testing standards set by the industry.

The request, made in the form of a petition backed up by volumes of research data on rubber extraction and migration, is unprecedented by an industry acting as a unit in the complex legal maneuvering brought on by enactment of the vexing additives law. The statute, as it is interpreted by FDA enforcement officials, classes many types of rubber items as "food additives" since small particles can migrate from the food handling equipment in which they are used for packing, processing, preparing, treating, transporting, or holding food, into the food itself. If found unsafe for human consumption, their use can be prohibited.

FDA officials say it will be some time before it can rule on RMA's blanket request. They point out the Association has submitted a detailed bill of particulars including detailed exhibits covering several hundred compounding materials, testing procedures, and voluminous data on the individual tests themselves—the result of two years of work by the special rubber industry committee on food additives.

Other observers noted that delay by FDA on a ruling will be a natural consequence of the change in Administrations that took place January 20. Government bureaus tend to take their time acting on pending matters when the operation of the bureau changes hands.

RMA's petition, presented by Edward Welch, of the Industrial Rubber Products Division, was made on behalf of industry producers of thousands of different types of rubber hose, belts, seals, gaskets, packaging materials, and other rubber items used in processing foods and beverages. It said that an FDA blanket authorization for use of these items would recognize that the food-handling products which meet its conditions would be considered safe for various uses in the food and beverage industries.

Exhibit A of the petition, for example, lists nearly 500 materials used in the making of rubber products employed by the food and beverage industries. This list includes elastomers, accelerators, retarders, activators, protective agents, plasticizers, fillers, pigments, lubricators, emulsifiers, and a number of other miscellaneous compounding ingredients. The exhibit states the maximum permissible, or safe, quantities of each by weight.

The RMA noted that "various food handling products of the rubber industry are compounded from a limited list of ingredients by elaborate and complicated technical processing equipment procedures. These procedures are carefully controlled and safeguarded, and are subject to constant testing to insure the health and safety of the public whose food they handle."

The petition pointed out in this connection that ingredients used in these products have been given a reprieve from the sanctions of the 1958 statute. These ingredients were given an extension of time last September 1 to be shown as safe to use in food-handling equipment. Ingredients used in other, non-rubber products were not reprieved, and some, for example, certain coloring agents, already have been banned by FDA.

The petition also makes the point that "no manufacturer of food handling products intends the use of such products to affect in any way the characteristics of the food contacted. In fact, no known tests reveal any effect on food, nor, indeed, even the presence of any residue of the food handling product in the food handled." It therefore asked that the ingredients catalogued "be approved for such food handling uses so long as such products do not produce total extractables of more than 20 milligrams per square inch in distilled water and 200 milligrams per square inch in hexane." These limits, it said, reflect the best current manufacturing procedures and are safe for intended food handling uses.

At another point the RMA petition said that "extensive studies on typical rubber food handling products in normal use conditions prove that the level of total extractables never exceeded 1/100th of one part per million in water. For example, beverage tubing has an average life of five to 10 years, but even reducing this to six months, total extractables were only .009 ppm. A typical conveyor belt lasts a customer for at least 10 years, but [RMA] assumed the service life of only five years and got total extractables of .005 ppm. A coffee urn gasket has a normal service life of over 1,000 uses, but the total extractables were only .004 ppm., assuming a life of only 100 uses; and a hose for edible fats with a minimum service life of five years results in total extractables of only .00005 ppm."

"The conditions of intended use, the long history of safe use, the carefully controlled manufacturing techniques and the results of multitudinous studies," the petition concludes, "confirm the safety of rubber products for their many food handling uses."

Winter Traction Tests Of Tires and Chains

The stop-and-go traction performance of various types of tires and tire chains on snow and ice covered roads is the subject of a study just completed by the Motor Vehicle Research Laboratory of the University of Wisconsin. The main conclusion of the study, presented at the fortieth annual meeting of Highway Research Board of the National Academy of Sciences in mid-January, follows.

Reinforced tire chains give the driving public the best overall performance in avoiding prolonged traffic delays and skid-wrecks during severe snow or ice conditions. Special winter tires, how-

(Continued on page 106)

Polybutadiene Goes Commercial In New U. S. Rubber Truck Tires

Polybutadiene has invaded the last major market for natural rubber in the United States, the truck tire field, and the bouncing balls tell the reason why.

The ball made of polybutadiene, on the left, bounces higher than the one on the right, made of natural rubber. This fact indicates that less of the kinetic energy of the former is converted into heat energy and means to rubber research scientists that polybutadiene has less heat buildup than natural rubber. In heavy-duty truck and off-the-road tires, where heat buildup is substantial, this characteristic gives polybutadiene, or a blend of polybutadiene and natural rubber, a great advantage over natural rubber.

United States Rubber Co., New York, N. Y., has pushed the opening wedge into the natural rubber market with the announcement that it is now producing two sizes of truck tires, 8.25/20 and 9.00/20, with treads made of a blend of polybutadiene and natural rubber.

U. S. Rubber estimates that the new tires with a polybutadiene-natural blend run from 15 to 20 degrees cooler and give approximately one-third more mileage than tires with all-natural or all-polyisoprene treads. It says also that the tires are so resistant to groove cracking as to eliminate this as a problem in truck fleet operations.

The company further announced that as fast as more polybutadiene becomes available it will use the polybutadiene-natural blend for additional sizes and types of heavy-service tires. U. S. Rubber is also doing some development work on an all-polybutadiene tire for possible future adoption.

At the moment the main limit is available polybutadiene. The only present commercial source of polybutadiene is the Borger, Tex., plant of Phillips Chemical Co., which went on stream the end of December with an annual capacity of 25,000 long tons.

Increased Supply Soon

Firestone Tire & Rubber Co., however, is scheduled to go into production some time in February at its new Orange, Tex., plant, which has an annual capacity of 30,000 tons. Next fall Goodyear Tire & Rubber Co. will go on stream with a $20-million plant near Beaumont, Tex. The plant will have a capacity of 40,000 long tons of either polyisoprene or polybutadiene, but is expected to be used for polybutadiene at the present time.

It is estimated that manufacturing capacity for polyisoprene and polybutadiene will be about 225,000 long tons annually by the end of 1962. Some 60,000 to 80,000 tons of this will be polyisoprene, turned out by Shell Chemical Co. About 500,000 long tons of natural rubber are used in the United States annually, mainly in truck tires and so-called off-the-road tires for tractors and heavy vehicles. Figuring a 50-50 blend of natural and polybutadiene, this might mean that polybutadiene could cut consumption of natural rubber to 250,000 long tons a year.

U. S. Rubber has been making truck tires of polyisoprene since March of last year, and Firestone makes a premium passenger tire of polyisoprene. The advent of polybutadiene tires, however, seems to be more immediately significant, as evidenced by the decision of most rubber companies to produce polybutadiene rather than polyisoprene during the immediate future.

Because of its advantages in lower heat buildup, polybutadiene is regarded as a must in truck tires of the future. Even producers of natural rubber, not given to publicizing synthetics, predict that in a few years most truck tires will be made of a blend of natural and polybutadiene.

Nicholas Bekema, manager of compounding, heavy service tires, for U. S. Rubber, bounces polybutadiene *(left)* and natural rubber *(right)* balls to show the reason why U. S. Rubber is now making truck tires with a polybutadiene blend. The reason—low heat buildup

Price Favors BR

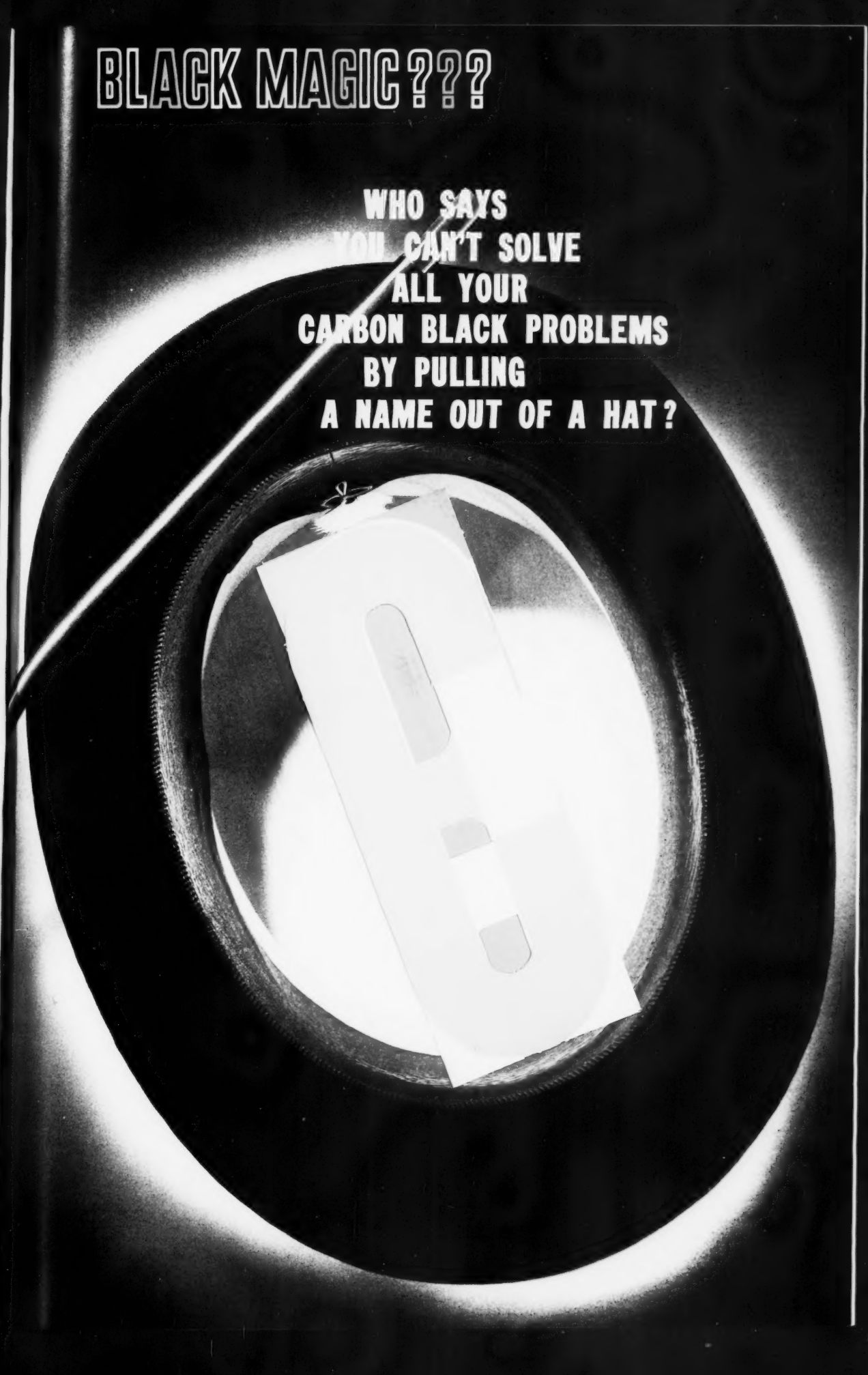
Polyisoprene, on the other hand, is virtually a duplicate of natural rubber, with its main advantage price differential and standardization of properties compared with the varying supplies of natural. At the moment Shell Chemical Co., the only supplier, is selling polyisoprene at 27¢ a pound, compared with 30¢ or a little bit more for natural. But if increasing supplies of rubber should drop the price of natural rubber to 25¢, as some suppliers predict, there is some question whether polyisoprene could meet the price.

The key here is that the process for producing isoprene monomer is relatively expensive, and, as a result, the monomer sells for about 25¢ a pound. This cost means that for companies, who, unlike Shell, do not produce a captive supply of isoprene, it would be hard to sell polyisoprene in competition with natural rubber selling at 30¢ or under.

(Continued on page 103)

BLACK MAGIC???

WHO SAYS
YOU CAN'T SOLVE
ALL YOUR
CARBON BLACK PROBLEMS
BY PULLING
A NAME OUT OF A HAT?



CABOT

TO SERVE YOU BETTER, MORE DIFFERENT GRADES OF CABOT CARBON BLACK:

REGAL:
Regal*600
Regal 300
Regal SRF

FURNACE:
Vulcan*9 SAF
Vulcan 6 ISAF
Vulcan 3 HAF
Vulcan XC-72 ECF
Vulcan SC SCF
Vulcan C CF
Sterling*99 FF
Sterling SO FEF
Sterling V GPF
Sterling L HMF
Sterling LL HMF
Sterling S SRF
Sterling NS SRF
Pelletex*SRF
Pelletex NS SRF
Sterling R SRF
Gastex*SRF

THERMAL:
Sterling FT
Sterling MT
Sterling MT-NS

CHANNEL:
Spheron*9 EP
Spheron 6 M

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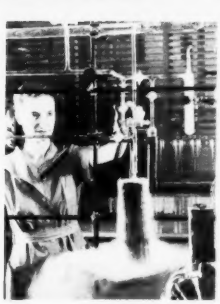

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DALLAS, TEXAS — 1309 Main Street
LOS ANGELES 5, CALIFORNIA — 3350 Wilshire Boulevard
NEW BRUNSWICK, NEW JERSEY — 46 Bayard Street
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Cabot Carbon of Canada, Ltd., 121 Richmond Street West, Toronto 1, Ontario, Canada
Cabot Carbon Limited, 62 Brompton Road, London, S. W. 3, England
Cabot France S.A., 45, rue de Courcelles, Paris 8, France
Cabot Italiana S.p.A., Via Larga 19, Milano, Italy
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CABOT CORPORATION

125 High Street, Boston 10, Massachusetts, U.S.A.

Printed in U.S.A. February 1961

(Continued from page 96)

Butadiene, on the other hand, sells for only 12.5¢ a pound. Therefore a price of 25¢ would be possible, and a price of 30¢ profitable. Phillips has set a price of 31.5¢ a pound f.o.b. in carload lots. The pilot quantities had been selling at 50¢. Since polybutadiene in a blend can improve the properties of natural rubber, it does not have to meet natural's price.

Even though within the realm of possibility, the prospects of an all-polybutadiene tire are considered somewhat remote by most people. The polymer, because of its tendency to crumble, is difficult to work by itself, though it can be done. More possible, perhaps, is a polybutadiene/SBR blend, which might give a low enough heat buildup to be competitive with natural and at a considerably lower price. Although SBR has most of the passenger tire market, it has never been considered suitable for the big tires.

One of the problems which will have to be faced by processors when Firestone and Goodyear put their polybutadiene plants into production is the difference between the Phillips, Firestone, and Goodyear products. There is reputedly considerable variation among the three rubbers in *cis*-content and in molecular weight, resulting in markedly different processing characteristics.

The Paceco TransTainer, a gantry crane developed by Pacific Coast Engineering Co., smoothly and quickly transfers piggybacks or cargo containers from trucks to rail cars. Four pneumatic rubber tires made by B. F. Goodrich Tire Co., Akron, O., support the crane and cargo with a combined weight up to 70,000 pounds. Traveling down a train loading and unloading as it goes, the crane does not lose time by backing off or making trips the length of the train

Reclaim Rubber Finds Growing Market As Bouncy Surface for Playing Fields

Some day in the not too distant future the Davis Cup tennis matches may be played on rubberized tennis courts, and the Kentucky Derby run on a rubber surfaced track, if the market for a reclaimed rubber surfacing material continues to grow.

The product is Saf-Pla, developed by U. S. Rubber Reclaiming Co., Buffalo, N. Y. A pretreated rubber crumb mixed with asphalt, Saf-Pla is weather resistant, provides a uniform surface which does not pit so easily as turf or clay, and is easier on the legs and feet than clay or concrete.

The product was originally installed on a driveway in Hamburg, N. Y., for the parents of a handicapped child. The purpose was to minimize or do away with the painful cuts, bruises, and abrasions the child suffered in falls. It worked so well that it was installed in many municipal and school playgrounds in the Buffalo area.

It was found, however, that Saf-Pla had other applications. Used as a surfacing for tennis courts, it gave tennis balls a bounce quite similar to that of a clay court. The courts, however, were easy to maintain, and the tennis players found that their feet took less of a pounding than on a clay court. Later the surfacing was used for pole vault, broad jump, and high jump approaches at a number of running tracks, both because it made a firmer, more springy surface and because it allowed players to use sneakers instead of spikes, eliminating the danger of spike wounds.

Saf-Pla most recently was installed in stall and paddock areas at several flat race tracks because the surfacing is easy on the delicate feet and legs of thoroughbred race horses. The obvious next step, although it may be a long time coming, is to try it out on the track itself. This would cut down on the terrific pounding a horse's legs get during a race and would also provide a consistent surface, not hard in dry weather and muddy after a rain.

Saf-Pla is raked on to a base of concrete, asphalt, or rolled stone topped by a tack coat. The material, a mixture of asphalt and coarse reclaim crumb, is allowed to cure for three or four hours before rolling. After the first rolling, with a three- to five-ton roller, a quantity of very finely granulated reclaim crumb is dusted on, and the surface is rolled again. The surface is allowed to cure for 48 hours to one week, depending on the weather.

Following this cure, if desired, the surface is painted with a latex seal coat and a surface paint of "Hypalon." Boundary lines, if any, are painted with a chlorinated rubber traffic paint. The surface paint is allowed to cure for 48 hours before painting boundary lines, and the boundary lines for 24 hours before use.

New Marketing Team

Tennessee Gas Transmission Co., Houston, Tex., and Cary Chemicals, East Brunswick, N. J., have announced a long-term production and marketing association.

Tennessee Gas, one of the principal handlers of natural gas and light hydrocarbons, will build a multi-million-dollar petrochemical plant on its Houston Ship Channel property. The facilities will consist of two units. One will have an initial annual capacity to manufacture 100 million pounds of acetylene. The second unit will convert a major part of the acetylene into vinyl chloride monomer.

Cary Chemicals, manufacturer of poly(vinyl chloride) plastics, will convert the vinyl chloride monomer to vinyl polymers for use in its compounding, calendering, and finishing divisions as well as for sale to the vinyl resin market.

Hare Photographs, Inc.

Buffalo tennis enthusiasts try out a tennis court surfaced with a mixture of asphalt and reclaimed rubber crumb, produced by U. S. Rubber Reclaiming Co. under the trade name of Saf-Pla. The product is said to insure a uniform, weather-resistant playing surface

J. S. Corrigall

N. Y. Rubber Absorbed

Acme-Hamilton Mfg. Corp., New York, N. Y., has acquired all of the shares of New York Rubber Corp. This new subsidiary will continue to operate the former New York Rubber Corp.'s Swainsboro, Ga., plant for the manufacture of inflatable rubber products such as life rafts, sporting goods, and other products. The plant is expected to add $6 million annually to the company's sales potential.

The company is also acquiring the sales force and distributors of New York Rubber as well as machinery for producing the rubber belting which was made at the corporation's former plant in Beacon, N. Y. These additional facilities will add about $2.5 million to Acme-Hamilton's volume and will enable the company to service all of the former belting customers of New York Rubber Corp.

Bouchard Retires From B. F. Goodrich

Patrick C. Bouchard has retired as Central American district manager for the B. F. Goodrich Co.'s international division. After joining the company as a stenographer in Boston in 1915 he took time out to serve as a private in World War I. He returned to Boston in 1919 and moved to Akron in 1923 as secretary to the company's export manager. Leaving the company from 1934 to 1939 to operate a private business venture in Brazil, he returned to Goodrich in 1940 as district manager at Lima, Peru. Shortly after Pearl Harbor, Bouchard returned to the United States to enter the Air Corps as a captain. He rejoined the company in 1945 as Central American district manager in Panama.

Vanderbilt Promotes Corrigall and Kern

J. S. Corrigall, who succeeded A. A. Somerville as vice president in 1954, has been appointed executive vice president and elected to the board of directors of R. T. Vanderbilt Co. Mr. Corrigall attended Trinity College School, Port Hope, Canada, and McGill University in Montreal. He joined Vanderbilt in 1944 and has directed the rubber, petroleum, export, and fungicide departments for the past six years.

E. S. Kern becomes sales manager of the rubber chemicals department. He is a chemical engineering graduate of the University of Missouri. Mr. Kern joined the company in 1932 after serving with The B. F. Goodrich Co. He was a technical sales representative for ten years and then transferred into the New York office to serve in various administrative sales capacities.

Both men took over their new duties on February 1.

BFG Leases Test Track

The nine-mile circular automotive test track being built by The B. F. Goodrich Co., Akron, O., near Pecos, Tex., will be controlled and operated by a separate company, Automotive Proving Grounds, under a lease agreement.

The Automotive Proving Grounds was formed by Frank E. Harper, who directed tire and tank track proving grounds for the U. S. Army during World War II and who was associated with The B. F. Goodrich Co. in various capacities since 1946.

Harper, president of the new company, said that in addition to testing tires for BFG, his firm will sell the services of the proving grounds to other companies for testing automotive products.

McNear Retires from United States Rubber

G. Roger McNear has retired after 27 years with United States Rubber Co., New York, N. Y. He joined the company in 1933 and has held positions as a jobber sales manager, factory manager of the Detroit tire plant, Pacific Coast sales manager, and assistant to the president of the company.

In 1951, McNear went to Edinburgh, Scotland, to become managing director of North British Rubber Co., Ltd., a subsidiary of U. S. Rubber. He returned to this country in 1957 to take over an administrative post in the tire division, largest of U. S. Rubber's five domestic manufacturing divisions.

E. S. Kern

BFG Ups Gift Matching

The B. F. Goodrich Co. recently announced that junior colleges and private secondary schools will now be included in its employe gift-matching program to aid colleges and universities. The company matches contributions of $25 or more from employes who have served The B. F. Goodrich Co. one or more years. It has also increased its gift-matching from $500 to $1,000 and has made contributions of members of its board of directors eligible for the matching funds.

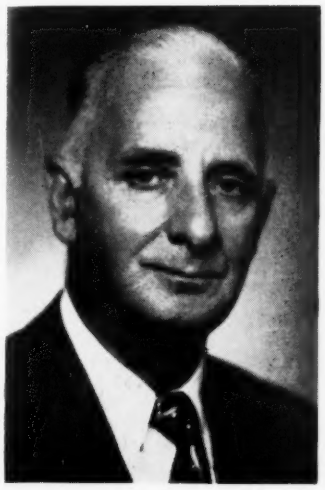
Started in 1955, the program already has helped 175 schools in 36 states. The recent additions will provide more money for a larger number of schools in the future.

West American Rubber Fiftieth Anniversary

West American Rubber Co., Los Angeles, Calif., one of the eldest rubber manufacturing firms on the Pacific Coast, celebrated its fiftieth anniversary in December, 1960.

The company currently employs 75 people in two plants totaling 50,000 square feet and is equipped to produce a complete line of industrial rubber products, including molding, lathe cutting, rubber-to-metal bonding, extrusions, roll building, sheeting, and special hand-built articles. Its new equipment includes a 20-ounce, fully automatic injection molding machine.

Following the trend toward synthetic rubbers, West American's laboratory has developed many highly specialized rubber compounds with properties designed for particular application, for example, extreme abrasion, high temperature, and resistance to difficult chemicals.



R. H. Gerke

J. W. Simmons

John Yacos, Jr.

Gerke, Haddad Retire From U. S. Rubber

Roscoe H. Gerke and Nassib Haddad have retired from United States Rubber Co., Wayne, N. J. The announcement was made at a luncheon given by the 25-Year Club at the Wayne Country Club.

Dr. Gerke, a senior research scientist at the research center, has made many major discoveries in rubber testing methods, high-temperature carbon black processing, and production of rubber products. He received a Naval Development award for his services as technical director of a company munitions plant at Charlotte, N. C., during World War II. He also holds 15 patents and has had 28 technical articles published. Formerly chairman of the Division of Rubber Chemistry of the American Chemical Society, Dr. Gerke was secretary of the Division for the past three years.

Mr. Haddad is in charge of the textile engineering laboratory at the research center. In his 43-year career with the company he was responsible for the design and construction of many new yarns, tapes, and fabrics; he holds eight patents in this field. Educated in Syria, Mr. Haddad spent six years in New England textile plants before entering the American Army in 1917. In 1923, he joined U. S. Rubber at its central textile section, which was then located in Orange, N. J., and later moved to Garfield.

Simmons Moved Up

John W. Simmons, president of Wilson Rubber Co., Canton, O., has been made executive vice president and chief of operations of Becton, Dickinson & Co., Rutherford, N. J. Wilson Rubber is a wholly owned subsidiary of Becton, Dickinson.

Stepping into the top operating spot at Wilson is John Yacos, Jr., former plant manager, who has been named general manager. T. L. Peterson, former manager of sales for the industrial division, becomes sales manager; George Lenhart was named factory superintendent in charge of all production; Elwyn H. Becker was appointed product development manager; Howard Olsen, controller; and William S. Zimmerman, plant manager.

Richard L. Moody, former Wilson sales representative, has moved to Canton as assistant sales manager, industrial division. L. E. Novy has joined the technical staff as plant chemist.

Two-Ply Tires Shipped For Test on Compacts

All the major tire manufacturers—Goodyear, Goodrich, Firestone, U. S. Rubber, and General Tire—are manufacturing and shipping two-ply tires to the auto companies for consumer testing, the companies revealed in individual announcements.

The announcements all stress the same advantages of two-ply over the present four-ply tires: lighter weight, cooler running and softer riding characteristics, with no loss in strength.

The General Tire & Rubber Co., Akron, O., said in its release that the two-ply tire will have relatively higher strengths than the four-ply because the strength of tire cord decreases with higher temperature.

The announcement of The B. F. Goodrich Co. stresses that the two-ply tire has as many pounds of Tyrex rayon tire cord in its carcass as the four-ply tire. Cords in each of the two plies are much larger and stronger than those used in the conventional tire. Because, however, the tire has a thinner sidewall and fewer plies to generate internal friction, it allows increased flexing without excessive build-up. General further states that the sidewall in the two-ply has 10% more deflection than in the four-ply.

Goodyear in its release reported that it had tested the tire for millions of miles on its own test tracks, and that taxicab fleets and other commercial vehicles had run up 16 million more miles on the two-ply tires. U. S. Rubber also revealed that it had tested the tires for millions of miles, and General said it had tested the tires for two years over the road and a year on its test track at Uvalde, Tex.

If the tire tests go off well, the major auto companies are expected to make the two-ply tires original equipment on the 1962-model compacts.

The two-ply tires now being turned out use rayon cord, since rayon cord tires are used as original equipment on passenger cars at the present time. U. S. Rubber and Goodyear, however, are also testing two-ply tires with nylon cord, with an eye to the replacement tire market.

Most of the companies have been making two-ply tires for some time for use on the smaller European cars.

Equipment Leasing Up

The value of production and office equipment leased by the rubber industry during 1960 was $9.2 million, a 70% gain over the 1959 figure. Robert Sheridan, president of Nationwide Leasing Co., Chicago, Ill., said in a year-end statement that equipment leased by all industry last year totaled $530 million. This was the first time leasing topped the half-billion mark.

The rapid growth of equipment leas-

ing in the rubber industry was attributed to: increased popularity of sale-leaseback transactions involving existing plant; more equipment manufacturers have introduced lease plans for their products; money remains tight, as evidenced by a 13% decline in corporate liquidity in the industry; and greater use of the open-end "master lease" under which companies can expand their leasing as the need of additional equipment arises.

Columbia-Southern Made PPG Division

Columbia-Southern Chemical Corp., a wholly owned subsidiary, became a division of Pittsburgh Plate Glass Co., Pittsburgh, Pa., on January 1. The division will be operated under the name of Pittsburgh Plate Glass Co., chemical division. The principal officers of Columbia-Southern Chemical Corp. were elected as officers of Pittsburgh Plate Glass Co. Joseph A. Neubauer became vice president and general manager, chemical division, and Chris F. Bingham, vice president-chemical sales.

The change in corporate structure was made to consolidate the operations of Columbia-Southern Chemical Corp. with those of Pittsburgh Plate Glass Co. The general direction and management of the chemical operations will not be affected by the corporate change.

The chemical division will continue to market its products under the trade name "Columbia-Southern Chemicals."

Goodyear to Make Isoprene Monomer

An $80 million capital expenditure program for The Goodyear Tire & Rubber Co. in 1961 was disclosed by Chairman E. J. Thomas in January.

One very interesting portion of the program was the announcement concerning the $20 million earmarked for the new synthetic rubber facility being built at Beaumont, Tex. While this plant for production of Natsyn and Budene (polyisoprene · and polybutadiene) had previously been announced, no mention was made that it will include the manufacture of isoprene. The inclusion of this raw material in the plans would indicate that a second source of polyisoprene will soon be on stream. Most other producers of the "synthetic naturals" seem to be concentrating on polybutadiene owing to the short supply and high price of the basic isoprene.

Mr. Thomas pointed out that this plant will produce twice as much rubber as all Goodyear plantations in the world put together.

(*Continued from page 95*)

ever, "are a definite aid for mild to medium winter conditions."

The report, based on an exhaustive test program by the University at Clintonville, Wis., was outlined for the meeting by Prof. A. H. Easton, director of the University's Motor Vehicle Research Laboratory. Following are his basic findings and recommendations for safer winter driving:

(1) The most hazardous winter surface condition is ice near or at the freezing temperature. (2) Braking distances on winter surfaces are in the order of three to 12 times as great as those on bare pavement. (3) Snow tires provide better traction on snow and ice than regular tires, but do not measure up in effectiveness to the performance of round wire tire chains. (4) Reinforced tire chains give the "best overall performance.

Among other specific findings Dr. Easton outlined were:

Use recommended tire pressures for best tire performance in icy conditions; so-called compact and lighter vehicles outperform heavier vehicles, including braking, except on constant radius curves — their shorter wheelbase provides a "distinct advantage"; and, for better visibility, windshield-wiper arms should exert a load on the blade, such that the pressure will be one ounce per inch of blade length.

In discussing the advertised claims of performance of tires in winter conditions, Easton urged the Research Board to take a stand occasionally against products whose performance is not in accord.

Easton, who is chairman of the National Safety Council's Committee on Winter Driving Hazards, noted that the Committee had passed a resolution condemning "misleading advertising concerning non-skid properties of tires." He said it is "unfortunate that some winter tire advertisers get carried away and present misleading information which is unfair to the majority of companies which stick to the factual information by stating the genuine progress they have made in the improvement of winter tires."

Nearly 3,000 highway engineers, officials, and urban planners attended the Highway Research Board meeting. The Board is a unit of the Division of Engineering & Industrial Research of the National Academy and the National Research Council. The Board was organized in 1920 to stimulate research and its application to highways and is supported by contributions from the 50 state highway departments, the U. S. Bureau of Public Roads, national trade associations, industry, and universities.

Tire Ad Complaint

The Federal Trade Commission charged late in December that Montgomery Ward & Co., Inc., Chicago, Ill., has made "fictitious pricing and savings claims for its automobile tires." In a formal complaint, FTC alleged that the "list prices" shown in newspaper advertisements are not Montgomery Ward's customary retail prices for the tires, as implied, but are substantially higher. Purchasers did not save the difference between these purported regular amounts and the advertised sales prices as represented, FTC claimed. The company has 30 days in which to file an answer.

This "mat puller," is employed by the U. S. Army Corps of Engineers at Vicksburg, Miss., in the placing of concrete block mattresses along the Mississippi River's lower banks in order to prevent soil erosion. Terra-Tires, developed by Goodyear Tire & Rubber Co., Akron, O., exert slightly more than 5-6 pounds of pressure per square inch, enabling the "mat puller" to roll back over the concrete blocks after placing the mattress, without damage to the blocks

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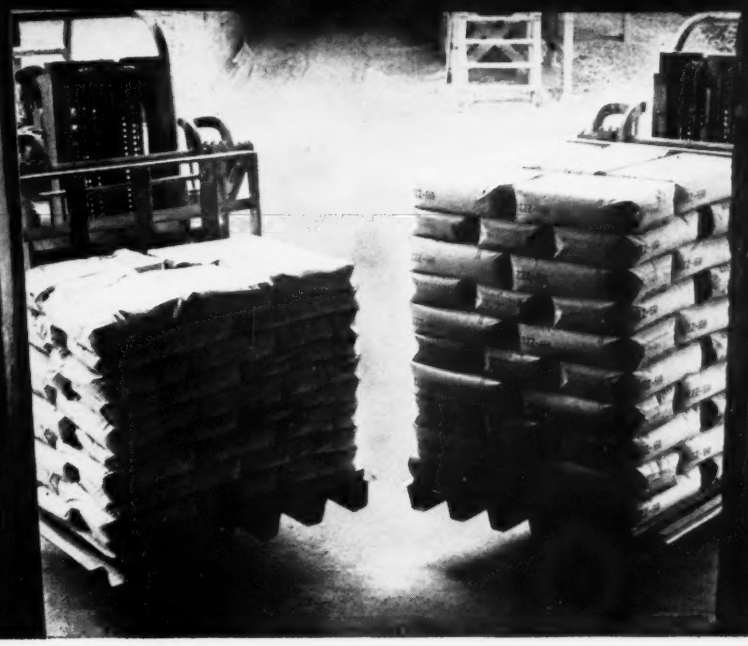

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news briefs

GENERAL ELECTRIC CO., silicone products department, Waterford, N. Y., is building a $1-million process plant which will produce new types of intermediate silicone chemicals. The new plant will be housed in a two-story structure that will add approximately 5,000 square feet of manufacturing space to the 13-year-old silicone plant. Slated to go into operation in mid-1961, it will be flexibly designed to carry out many reactions, including Grignard syntheses.

ALDAN RUBBER CO., Philadelphia, Pa., has become a licensed SYLMER finisher, according to a joint announcement issued by the company and Dow Corning Corp. Aldan will apply the silicone finish to both natural and synthetic coated fabrics for use in rainwear, thermal insulated clothing such as children's snowsuits and ski clothes, and other coated products where a high degree of repellency is required.

E. I. DU PONT DE NEMOURS & CO., elastomer chemicals department, Wilmington, Del., has developed an improved bag containing a loose polyethylene liner for handling "Hypalon" 20. It is designed to eliminate sticking that may occur if the polymer flows into the corners of the gusseted bag, thus permitting easier handling during the weighing or mixing operation. Studies have shown that the polyethylene liner will disperse well in batches mixed at temperatures in excess of 200° F. The liner, however, should be removed from the polymer when mixing at lower temperatures.

ARMSTRONG CORK CO.'s industrial division, Lancaster, Pa., has developed a new gasketing material that approaches a "universal" Aerosol valve stock. Called Armstrong NO-773-A, the new rubber compound eliminates for most applications the need of having both a CR and a NBR stock. Most valve manufacturers previously had to specify CR or NBR compounds, depending on the valve's end-usage. The new material meets the requirements for both NBR and CR parts in methylene chloride, toluene, kerosene, benzene, methyl alcohol, ethyl acetate, carbon tetrachloride, O-dichlorobenzene, denatured ethyl alcohol, MIL Type II fuel, ASTM #1 oil and #3 oil.

POLYMER CORP., LTD., Sarnia, Ont., Canada, will construct a new building to house the offices and facilities of the marketing division staff including especially designed laboratories in which to carry out technical service work to develop and promote the use of Polysar products.

ENJAY CHEMICAL CO., a division of Humble Oil & Refining Co., plans expanded facilities that will almost double production capacity of benzene and toluene at the Baytown, Tex., refinery. Humble will construct toluene dealkylation facilities for the production of benzene, increasing capacity from 30 to 55 million gallons a year. The project will also include the expansion of toluene extraction capacity from 32 to 55 million gallons a year.

THE LATEX FOAM RUBBER COUNCIL reports that indicative of the continuing trend to high-quality home furnishing, approximately 21% of the nation's upholstered furniture manufacturers are featuring more latex foam rubber cushioning in their new product lines than they did last year. The median average of increased latex foam usage in new furniture is 15%, according to results of a national survey conducted by the Council. Of the remaining 79% of the furniture makers replying to the questionnaire, slightly more than 59% are now utilizing the same amount of latex foam as they did in their previous upholstered furniture lines.

STILLMAN RUBBER CO., extruded products division, has moved into its new 30,000 square-foot plant in Orange, Calif., which is more than double the size of the firm's former facilities at Fullerton, Calif.

GOODYEAR TIRE & RUBBER CO. OF CANADA, LTD., will discontinue the production and marketing of foam rubber products because of the competition of cheaper petroleum-based products.

PHILLIPS CHEMICAL CO.'S new plant is now producing high-quality HAF and ISAF blacks. Four miles northeast of Orange, Tex., the Echo Philblack plant will produce 60 million pounds per year of these blacks.

GOODYEAR TIRE & RUBBER CO., chemical division, Akron, O., has raised the price of Goodyear Airfoam for the furniture, upholstery, and allied fields. Pin Core Airfoam will be increased 3%; while certain other items in the line will show greater increases on an individual basis. The new price structure will not affect Airfoam slab or Pliofoam, which is the Goodyear company's polyurethane cushioning material.

VELSICOL INTERNATIONAL CORP., C. A., has formed a subsidiary in Mexico—Velsicol Internacional de Mexico, S. A. de C. V., Mexico 1, D. F. The new company will warehouse and sell paint resins, rubber resins, floor tile resins, hardboard saturants, and the important agricultural insecticides—heptachlor, endrin, and chlordane. All of these products are manufactured in the United States by the Velsicol Chemical Corp. of Chicago, Ill.

WHEELABRATOR CORP., OF CANADA, LTD., Scarborough, Ont., successor to the Canadian division of Wheelabrator Corp., Mishawaka, Ind., was organized to handle expanding sales and fabricating activities for all provinces in Canada.

GOODYEAR TIRE & RUBBER CO., Akron, O., predicts record sales for its flooring products in 1961. The company anticipates an increase of at least 17% over the previous high. Made at the annual winter flooring market, the forecast is based on several factors, including an improved home building and remodeling business picture, consumer trends, and the company's continued product diversification and expansion.

BEACON CHEMICAL INDUSTRIES, INC., Cambridge, Mass., has drastically reduced the prices on its "Phosphonol" surfactants. Effective December 23, the following prices are quoted for carload or tankload (drum): "Phosphonol" O—40¢, H—80¢, N—50¢, and T—60¢. A series of complex alkyl and modified alkyl phosphates, the "Phosphonols" are strongly acid and should be diluted and neutralized before addition to acid sensitive systems such as rubber latices, soaps, or alkali-soluble resin solutions.

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news about people

Richard W. St. Onge has been appointed technical sales and service representative for Scott Testers, Inc., Providence, R. I. He has been assigned the New Jersey, Delaware, Maryland, and eastern Pennsylvania area.

Robert H. Cannon, Jr., has been appointed to the newly created post of assistant sales manager in charge of field sales for the chemicals division, Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co. He most recently was eastern regional sales manager with headquarters in the company's distribution center at Lodi, N. J. In his new position he will be headquartered at Kingsport, Tenn. **George J. Taylor,** formerly district sales manager in charge of the division's Philadelphia office, becomes eastern regional sales manager. He will continue to make Philadelphia his headquarters. **W. C. Cook,** a sales coordinator in Kingsport, is now district sales manager of the Philadelphia office; while **R. Clay Dubberly,** formerly sales representative in charge, becomes district sales manager of the division's Cleveland office, to which **David S. Oaks,** a new sales representative, has been assigned.

Leonard A. Wohler is now manager of latex sales for the Firestone Synthetic Rubber & Latex Co., Fall River, Mass. He succeeds **E. H. Ketner,** who resigned. **D. E. Auten** has been appointed a sales representative.

John M. Archiable has been named director of foreign operations for Emery Industries, Inc. This assignment includes responsibility for Emery Industries (Canada), Ltd., London, Ont., Canada, and Unilever-Emery N. V., Gouda, Holland. In addition, he has been appointed corporate director of the manufacturing staff. **R. F. Brown** and **G. W. Boyd** have been made general managers of the organic chemicals division and the fatty acid division, respectively.

Philip Moore becomes vice president in charge of manufacturing of the Linear, Inc., Dallas, Pa., plant. He will direct complete plant operations including engineering, scheduling, manufacturing, personnel, and labor relations in the production of the company's mechanical packings and seals.

R. W. St. Onge

B. M. Robertson

R. H. Cannon, Jr.

G. J. Taylor

L. A. Wohler

D. E. Auten

P. Moore

C. Rand, Jr.

Bruce M. Robertson has been named vice president and comptroller of The Goodyear Tire & Rubber Co., Akron, O., to succeed **Harry Hillman,** who retired after 27 years with the firm.

James J. Gannon has been named manager-technical service laboratory of General Aniline & Film Corp's Collway pigments division. He will be responsible for technical service and applications research of the division's present pigment product lines, maintaining his headquarters at the company's Linden, N. J., plant. **Vollney Tullsen** has been made manager-pigment research and development, with responsibility for present pigment product lines. He will also have his headquarters at the Linden plant.

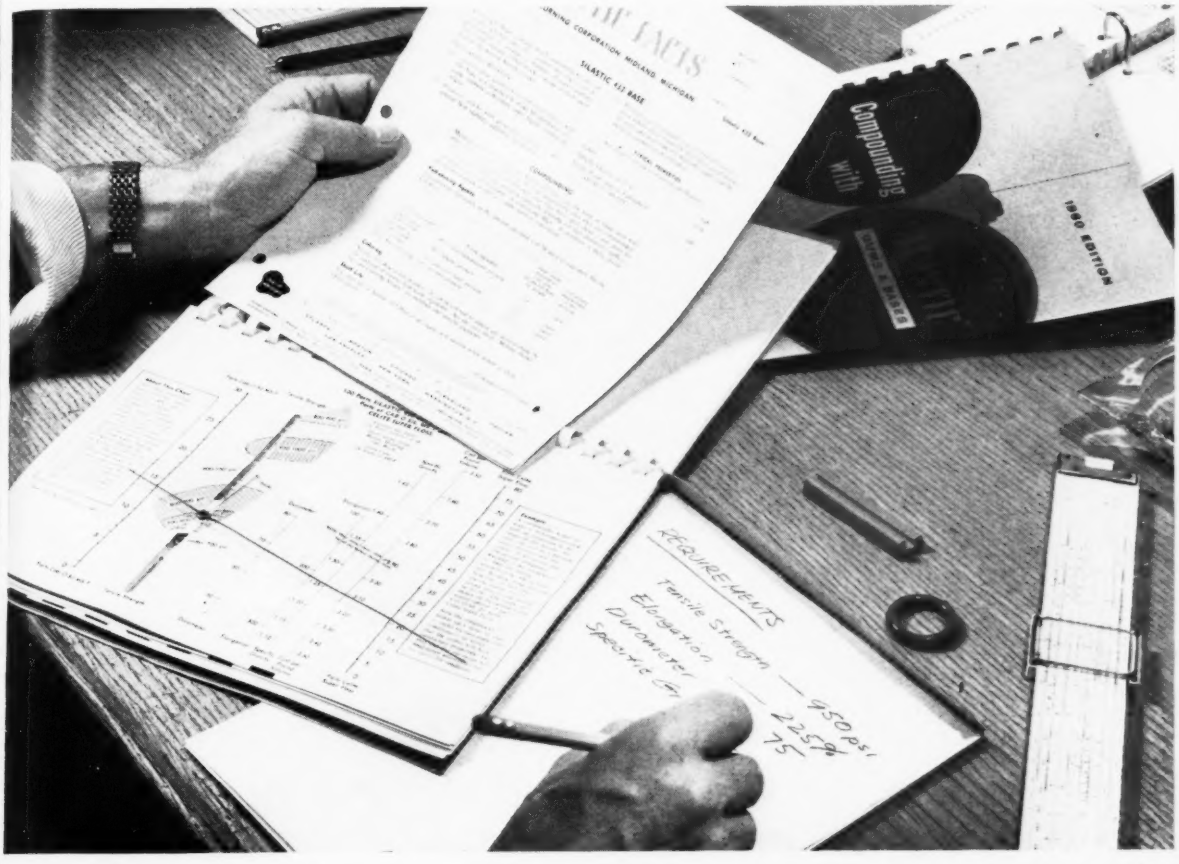
Dawes Walter has joined Pennsalt Chemicals Corp., Philadelphia, Pa., as manager of advertising and public relations. Previously Mr. Walter was with Atlantic Refining Co., where he held various marketing and advertising management posts since 1952. **Richard S. Lee** has been named assistant advertising manager, at Pennsalt, moving to his new assignment from the post of sales promotion manager, industrial chemicals division.

F. Lee Terhune has been named West Coast representative for Food Machinery & Chemical Corp.'s chemicals and plastics division. He will handle sales of plasticizers and other organic chemicals from the division's office in Los Angeles, Calif.

A. F. Hardman, research chemist, who this year marks his forty-first year with Goodyear Tire & Rubber Co., Akron, O., has been presented the Dinsmore Award of Merit for 1961, an award given to individuals recognized for original thinking and cooperative action in developing new or better products.

Charles Rand, Jr., has been appointed Midwest district sales manager for Western Petrochemical Corp.'s Warwick Wax division. To be based at the company's Chicago headquarters, he will also coordinate activities of distributors throughout the Midwest. He was formerly with Hooker Chemical Co., Durez Plastics Division.

The Compleat Compounder



Silastic Bases Simplify Compounding, Expand Formulating Freedom

Rubber compounding is a complex problem with the many polymers available today. But you can avoid many of the problems involved in compounding silicone rubber by always starting with Silastic® gums and bases. When you buy Silastic brand compounding materials you're actually buying a compounding service. Look at what this includes:

1. Dow Corning supplies the initial information you need. Tested recipes, formulations to meet MIL specs, newest procedures and personal technical service are all available to compounders.

2. Number of ingredients added to Silastic gums and bases are minimized when compounding. To compound for a specific property, you need only five or six ingredients—not a dozen plus. Many properties your customer needs are inherent in Silastic...serviceable range from —130 to 500 F, low compression set, high elongation, strength and even superior solvent resistance.

3. Silastic gums and bases band quickly, won't crumble, absorb fillers readily and can be stripped from mill rolls with a knife. Silastic has good green strength and minimum shelf life of six months.

With one Silastic base material you can compound for a wide range of physical properties or applications, thus speeding production and improving the quality of your products. Stocks made from a Silastic base fabricate easily into custom parts to meet any customer's design. Another tangible benefit: you now inventory only one base instead of many finished stocks.

We invite you to investigate the advantages you accrue in compounding with Silastic materials, then make *your* own decision. Write for full information by addressing Dept 7914.

Dow Corning Silicones solve sticking problems, too... as mold release agents, and as paper coatings for packaging and processing sticky materials.

first in silicones

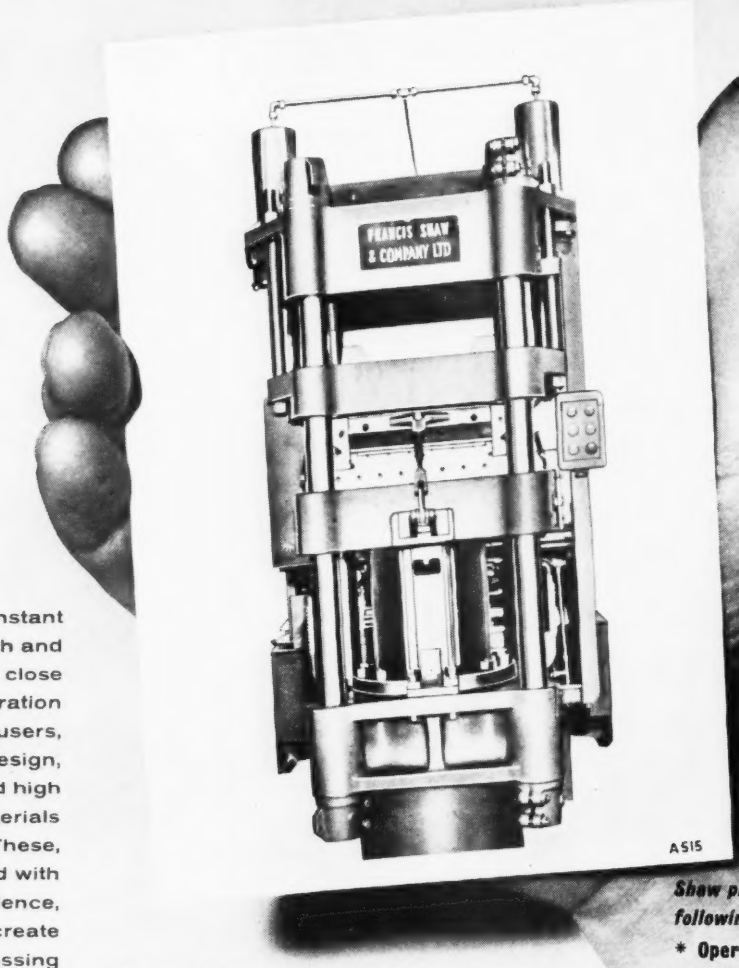
Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

behind every

Francis Shaw machine

research · design · quality engineering



Constant research and development, close co-operation with users, advanced design, selected high quality materials ... These, coupled with long experience, help to create processing machinery of unrivalled perfomance.

Francis Shaw hydraulic presses are tailor-made to every requirement of the rubber industry. Illustrated is a 254-ton press recently installed for production of car battery containers.

Shaw presses include the following design features:

* **Operation from individual pumps or hydraulic mains.**
* **Automatic cycle if required.**
* **Steam or electrical heating.**
* **Appropriate size for every requirement.**

S ***Francis Shaw***

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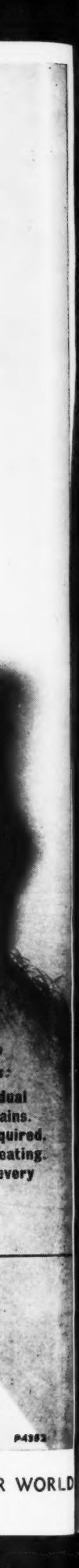
OVERSEAS AGENTS THROUGHOUT THE WORLD

P4353



news about people

J. Wood

E. J. Weaver

W. J. Watson

S. R. Zimmerman

K. J. Morray

R. B. Park

K. J. Morray has been named sales manager of General Electric Co., silicone products department, Waterford, N. Y. He succeeds **Thomas J. March,** now manager of sales operations of the company's newly-established internal automation operation in Schenectady, N. Y.

Robert A. Gentle, product engineer for B. F. Goodrich Aviation Products division's wheel and brake plant at Troy, O., is the new European aviation products technical representative for International B. F. Goodrich Co., The Hague, Holland, succeeding **Charles Stebbins,** who is retiring.

George Meyer becomes vice president-manufacturing of Parker Seal Co., division of Parker-Hannifin Corp. He was manager of manufacturing at the company's headquarters in Culver City, Calif., and is responsible for all Parker Seal's manufacturing facilities there and at East Los Angeles, Calif., and Berea and Lexington, Ky.

Jean Wood has joined the sales staff of Geigy Industrial Chemicals, division of Geigy Chemical Corp., Ardsley, N. Y. He will represent the organization in Texas, Louisiana, Oklahoma, Mississippi, and Arkansas.

Elsworth J. Weaver has been promoted to the newly created position of technical director for The Frank G. Schenuit Rubber Co., Baltimore, Md. He will be responsible for coordinating and directing tire design development, laboratory and quality control departments. **Richard N. Pierce** becomes manager, product development and engineering, replacing **William H. Ramsthaler,** who will remain with the company on a consulting basis. **Max D. Waring** has been named quality control manager.

S. R. Zimmerman, Jr., becomes executive vice president of Raybestos-Manhattan, Inc., Passaic, N. J. He is a director and a vice president of the corporation, general manager of the United Asbestos-Grey-Rock Division, Manheim, Pa., and in charge of operations of the Pacific Coast Division, Fullerton, Calif.

William J. Watson has been named vice president of General Latex & Chemical Corp. of Ohio, Ashland, O. He will also continue his present duties as general manager.

R. B. Park has been made sales manager-industrial rubber and mechanical packings, Raybestos-Manhattan, Inc., Passaic, N. J. He was assistant sales manager of these activities since July, 1959, and previously had been district manager in San Francisco. **R. B. Hazard,** formerly vice president and sales manager-industrial rubber and mechanical packings, has now been appointed vice president-sales for these divisions.

Almon Allard, since 1946 assistant export manager of Cabot Corp., Boston, Mass., has become export service manager. Joining Cabot in 1933, Allard worked in various capacities in the Boston office and research laboratories. **Morton M. Charnley,** retiring export manager, will continue with the company as consultant for the next few months.

M. A. Lynch, Jr., has become assistant to the manager of product marketing for Union Carbide Corp., silicones division.

Claude C. Corkadel, Jr., has been appointed vice president of Dural Rubber Co., Flemington, N. J., a subsidiary of Oliver Tire & Rubber Co.

LOOKING FOR A

BLACK

Non-extended Masterbatch?

TRY 8155...

It gives you the excellent properties of a cold rubber plus very high abrasion resistance and improved processing and mixing (aided by the addition of 12.5 parts of processing oil). The high quality of this polymer makes it particularly suited for premium tire treads and high-quality, high-abrasion mechanical goods.

Description:

Polymer Type	SYNPOL 1500
Oil	Highly Aromatic, 12.5 Parts
Carbon Black	ISAF
Emulsifier	Rosin Acid
Stabilizer	Staining
Coagulant	Acid

TYPICAL PRODUCTION VALUES

Chemical:

Volatile Matter, % wt.	0.2
Ash, % wt.	0.18
Organic Acid, % wt.	3.84
Soap, % wt.	0.9
Carbon Black, % wt.	31.7
Oil, % wt.	7.11

Physical:

Compound Viscosity, ML-4 @ 212°F.	52
Tensile Strength, 50′ Cure @ 292°F.	3600
Elongation, 50′ Cure @ 292°F, %	560
Modulus @ 300% Elongation, psi	
25′ Cure @ 292°F	1250
50′ Cure @ 292°F	1640
100′ Cure @ 292°F	2000

Test Recipe:

SYNPOL 8155A	146.00
Zinc Oxide	5.00
Sulfur	2.00
MBTS	2.00
Stearic Acid	1.50

...one of the reliable

SYNPOL®

SBR'S

ST. JOE

"Controlled-Analysis"

ZINC OXIDES
For The
RUBBER INDUSTRY

Direct Reporting On Baird-Atomic Spectrometer

RUBBER GRADE — FAST CURING TYPES

BLACK LABEL No. 20

Very fine particle size, giving maximum reinforcement and activation in rubber. For highest quality rubber goods.

RED LABEL No. 30

Excellent reinforcing and activating properties in rubber. Having fewer extremely fine particles, it is easier to incorporate than Black Label No. 20.

RUBBER GRADE — SLOW CURING TYPES

RED LABEL No. 31

Slow curing type for long flat cures and excellent scorch resistance. Good activating and reinforcing properties.

RUBBER GRADE — SURFACE TREATED TYPES

BLACK LABEL No. 20-21
GREEN LABEL No. 42-21

These grades are made from Black Label No. 20 and Green Label No. 42, respectively, by surface treating with a nontoxic hydrophobic high molecular weight organic material. They disperse in a rubber mix rapidly and thoroughly, developing physical properties, in vulcanized rubber comparable to standard Black Label No. 20 and Green Label No. 42.

LATEX GRADE

BLACK LABEL No. 20

Very fine particle size, giving minimum settling out in water dispersions and maximum activation in Latex Compounds.

GREEN LABEL No. 12

Heavily-calcined Black Label No. 20 type, containing few extremely fine particles. Less reactive than Black Label No. 20 and produces low viscosity water dispersions which do not readily thicken.

GREEN LABEL No. 43

Medium particle size for easy wetting. In pellet form this grade is particularly advantageous in preparing pourable 70% zinc oxide water dispersions.

GREEN LABEL No. 42

General purpose type. Excellent activating and moderate reinforcing properties. Faster rate of incorporation into rubber than Black Label No. 20 or Red Label No. 30.

GREEN LABEL No. 43

Large particle size type for easy incorporation. Good activating and reinforcing properties.

GREEN LABEL No. 42A-3

Somewhat larger in particle size than Red Label No. 31 for easier incorporation; otherwise, similar in general characteristics.

GREEN LABEL No. 46

Low pH type used in foam latex where zinc oxide is used for both activation and as a supplementary gelling agent.

RED LABEL No. 30

Intermediate particle size, having fewer extremely fine particles than Black Label No. 20. Less reactive than Black Label No. 20, producing lower viscosity water dispersions which do not readily thicken.

LEAD-FREE ST. JOE ZINC OXIDE

St. Joe's Distributor Network Puts St. Joe ZnO On Your Doorstep.

AKRON, O.	DENVER, COLO.	LONG ISLAND CITY, N. Y.	ST. LOUIS, MO.
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BALTIMORE, MD.	GREENVILLE, S. C.	MEMPHIS, TENN.	SAN ANTONIO, TEX.
BOSTON, MASS.	HOUSTON, TEX.	OKLAHOMA CITY, OKLA.	SAN FRANCISCO, CAL.
BUFFALO, N. Y.	HUNTINGTON, W. VA.	OMAHA, NEB.	SEATTLE, WASH.
CHICAGO, ILLINOIS	JACKSONVILLE, FLA.	PHILADELPHIA AREA, PA.	TRENTON, N. J.
CINCINNATI, O.	KANSAS CITY, MO.	PITTSBURGH AREA, PA.	TULSA, OKLA.
DALLAS, TEX.	LITTLE ROCK, ARK.	PORTLAND, ORE.	WICHITA, KAN.

Write for the name of the St. Joe distributor nearest you.

ST. JOSEPH LEAD CO.

250 Park Avenue • New York 17, N. Y.
Plant & Laboratory: Josephtown (Monaca) Pa.

ZNO-152

news about people

R. C. Woerner

Don Evans

Rudolph C. Woerner has been elected vice president-manufacturing, Petro-Tex Chemical Corp., Houston, Tex. Long associated with Sinclair Refining Co., Mr. Woerner joined Petro-Tex in 1955 as director of engineering when that company took over the Sinclair-operated Rubber Reserve Corp. butadiene plant at Houston; he was promoted to plant manager in 1959.

John S. P. Wilson, Jr., director of personnel for B. F. Goodrich Co., Akron, O., for the past year, has been named director of employe relations for B. F. Goodrich Tire Co., a division. After assignments in the company's industrial relations departments in Akron, he became personnel manager of its Miami, Okla., tire plant and was there eight years before returning to Akron in 1958 as corporate union relations representative.

Gifford G. Zimmerman, manager of tire, airline, and distributor sales of B. F. Goodrich Aviation Products, a division of The B. F. Goodrich Co., Akron, O., has been named division manager, field sales.

William N. Davies, previously general manager, Interchemical Corp., color and chemicals division, Hawthorne, N. J., has joined the headquarters staff as Interchemical vice president-sales. He will specialize in the sales activities and diversification planning of the entire corporation. **C. Stanley Johnson** succeeds Mr. Davies as general manager, color and chemicals division, relinquishing his duties as vice president, printing ink division.

Henry E. Heilman, vice president of International B. F. Goodrich, a division of The B. F. Goodrich Co., Akron, O., has assumed responsibility for foreign subsidiary manufacturing and sales operations.

Charles E. Kinley, a shift foreman in the Akron tire plant of The B. F. Goodrich Co., will go to Melbourne, Australia, to assist in the production effort of B. F. Goodrich Australia Pty. Ltd., a newly organized subsidiary.

Fred C. Sutro, Jr., has been made marketing manager-polyolefins of Cabot Corp., Boston, Mass. He was previously employed as product manager-polyethylene, Spencer Chemical Co., Kansas City, Mo.

Rolla H. Taylor, sales manager, Scott Testers, Inc., Providence, R. I., has also been made advertising manager. He will be responsible for all the company's advertising, publicity, and public relations, in addition to his sales management duties.

Stanley D. Brumby, a wage and salary analyst for The B. F. Goodrich Co. for the past year, will go to Teheran, Iran, as control manager of B. F. Goodrich Iran S.A., a subsidiary. He joined the company as an industrial engineer in 1953 and was a job analyst from 1956 to 1959.

Albert J. Tribuzi, a tire construction engineer with International B. F. Goodrich Co., division of The B. F. Goodrich Co., has accepted an assignment at Lima, Peru, for the company. He will be senior product engineer for Lima Rubber Co., a BFG associate company.

Frank J. Brohman has been named vice president and general manager of Precision Rubber Products (Canada), Ltd., Ste. Therese de Blainville, P.Q., Canada. He was formerly general sales manager of the company.

E. C. Slaght, Jr., becomes vice president and technical director of Heyden Newport Chemical Corp., Newport Industries Division, Pensacola, Fla. He will organize and coordinate the Division's expansion and new product programs.

Whitney Lawrence has been appointed chief chemical engineer for U. S. Peroxygen Corp., Richmond, Calif. He formerly was with Nopco Chemical Co. as an assistant plant manager.

James M. Hughes becomes sales manager, regular products of Dresser Mfg. Division, Dresser Industries, Inc., Bradford, Pa. He will direct the promotion and sale of all pipe jointing and pipe repair products.

Alex Katona has been named supervisor-pilot plant of the research and development department, Hooker Chemical Corp., Niagara Falls, N. Y. Joining this department in 1954, he worked in the cell development group, pilot plant, and for the past year as a product development representative.

LOOKING FOR A

COLD

Non-extended SBR?

TRY 8104...

It features excellent physical properties and color plus excellent processing, smooth finish and controlled shrinkage ... a valuable combination for such applications as footwear, open and closed cell sponge and mechanical goods.

Description:

Polymer .....Low Mooney, Cold Type
Emulsifier .....Fatty Acid
Coagulant .....Alum
Stabilizer. Non-staining, Non-discoloring

TYPICAL PRODUCTION VALUES

Chemical:

Volatile Matter, % wt. 0.12
Ash, % wt. 0.91
Organic Acid, % wt. 5.15
Soap, % wt. 0.05
Bound Styrene, % wt. 23.3

Physical:

Mooney Viscosity, ML-4 @ 212°F. ...30
Compound Viscosity, ML-4 @ 212°F. .39
Tensile, psi, 50' Cure @ 292°F. ...3400
Elongation, 50' Cure @ 292°F, % ...640
Modulus @ 300% Elongation, psi
25' Cure @ 292°F. 650
50' Cure @ 292°F. 1125
100' Cure @ 292°F. 1450
Water Absorption, mg/cm² 1.2

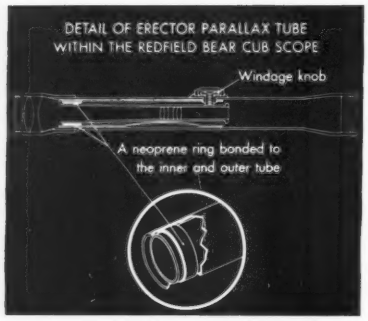
Test Recipe:

SYNPOL 8104 .....100.00
EPC Black 40.00
Zinc Oxide 5.00
Sulfur 2.00
MBTS 2.00

... one of the reliable

SYNPOL®

SBR'S


DETAIL OF ERECTOR PARALLAX TUBE
WITHIN THE REDFIELD BEAR CUB SCOPE
Windage knob
A neoprene ring bonded to
the inner and outer tube

Eastman 910 Adhesive solves another production bottleneck

Ames Rubber Company, of Hamburg, New Jersey, assembles the erector parallax tube for the Redfield Gunsight Company's "Bear Cub Scope," a precision telescopic rifle sight.

In it, two concentric aluminum tubes are bonded to a neoprene ring.

Vulcanizing the ring in place required complex jigs, long curing times. Labor and material costs were high. Concentricity tolerances were frequently exceeded, with a resulting high rejection rate.

Fast-setting, high-strength Eastman 910 Adhesive solved their problem. *Now the part is assembled in 2 minutes, goes to the shipping room within 5 minutes.*

Over 50,000 units have been produced with no reports of bond failure.

Eastman 910 Adhesive is making possible faster, more economical assembly-line operations and new design approaches for many products. It is ideal where extreme speed of setting is important, or where design requirements involve joining small surfaces, complex mechanical fasteners or heat-sensitive elements.

Eastman 910 Adhesive is used as it comes. No mixing, no heating. When spread into a thin film between two surfaces, light manual pressure triggers setting. With most materials, strong bonds are made within minutes.

What production or design problem can this unique adhesive solve for you?

Bonds Almost Instantly with Contact Pressure
No Heat...
No Catalyst...

For a trial quantity (⅓-oz.) send five dollars to Armstrong Cork Co., Industrial Adhesives Div., 9105 Inland Road, Lancaster, Pa., or to Eastman Chemical Products, Inc., Chemicals Div., Dept. R-2, Kingsport, Tenn. (Not for drug use)

news about people

Oliver W. Nelson has been made vice president and general manager of the Sherman Rubber Machinery Co., a division of Botwinik Brothers of Mass., Inc., Worcester, Mass. **Arnold Suokko** becomes sales engineer.

Robert J. Reid has been appointed manager of marketing, research, and distribution of General Tire & Rubber Co. of Canada, Ltd., Welland, Ont., Canada.

H. H. Deist has been promoted to manager of the engineering laboratory at Firestone Tire & Rubber Co., replacing **George P. Bosomworth,** who retired after 35 years of service. **A. M. Lancaster,** a senior staff engineer, succeeds Deist as assistant manager.

George G. Kerr has been made general manager of The Goodyear Tire & Rubber Co.'s shoe products division, replacing **Frank R. Evans,** now general manager of the foam products division. **Charles B. Marks, Jr.,** administrator of marketing for the new products department, succeeds Kerr as general sales manager, shoe products division.

Robert M. Tong has been made general sales manager of Manufacturers Chemical Co., Inc., Camden, N. J. Formerly with General Latex & Chemical Corp., he has had extensive experience in textile chemical resin sales and new product development.

J. W. H. Miner has been appointed president and general manager of Miner Rubber Co., Ltd., Granby, P.Q., Canada; **N. A. Austin** becomes vice president and director; **W. G. Simpson** was elected to the board of directors; and **F. Houghton** was named a director of Miner Rubber (London), Ltd.

William R. Bond, manager of corporate recruiting for The B. F. Goodrich Co. since 1958, has been named Akron personnel manager. In his new position he will continue to be responsible for the company's college recruitment program.

Louis P. Deis has been made manufacturing superintendent for AviSun Corp.'s film and fiber plant in New Castle, Del. He was previously section leader of polyolefin film development in the American Viscose research and development laboratories.

W. F. Jordan, formerly sales manager of Firestone Synthetic Rubber & Latex Co., Akron, O., will fill the newly created post of vice president in charge of sales, and **C. A. Hill,** formerly general production manager, will become vice president in charge of production. They will be responsible for the sales and production of synthetic rubber from company plants in Akron, Lake Charles, La., and a new plant at the Petrochemical Center, Orange, Tex., where the firm's Coral and Diene rubbers will be produced.

Harold J. Harmon, formerly assistant manager of the overseas division of The General Tire & Rubber Co., Akron, O., has been named manager, assuming the management functions of **Frederick Comey,** who will continue with the company in an advisory capacity.

C. R. Lee will head the Buffalo sales office of Eastman Chemical Products, Inc., chemicals division, subsidiary of Eastman Kodak Co. For the past two years he has represented the company in Chicago in the sale of its industrial and specialty chemicals. **Ted K. Bailey** becomes sales representative in the Chicago area. His previous assignment was in the company's customer service laboratory which is located in Kingsport, Tenn.

Carl V. Booth has been named vice president of Oliver Tirecap Supply Co., Oakland, Calif., distributor of Oliver tire tread rubber and tire repair materials. Since 1955 he has been manager of the company, which responsibilities he will retain.

Alfred N. Watson, formerly vice president of Alfred Politz Research, Inc., has been elected vice president, marketing services, for United States Rubber Co., New York, N. Y.

W. C. Botkin has become vice president of Dominion Rubber Co. of Canada, Ltd., Montreal, P.Q., Canada. He will continue to serve as treasurer of the company, a position he has held since 1946.

John J. Bertram, Jr., has been appointed manager, advertising and sales promotion, American Hard Rubber Co., a division of Amerace Corp., Butler, N. J. Formerly he had been assistant advertising manager of Gaylord Container Division, Crown Zellerbach Corp.

Benjamin E. Elzey has been named senior sales development man, sundries sales department of B. F. Goodrich Industrial Products Co., Akron, O., a division of The B. F. Goodrich Co.

WESTERN PETROCHEMICAL CORP., Warwick Wax Division, has established a West Coast sales district with headquarters in Pomona, Calif., and named Lyle Christensen district sales manager.

CALENDAR of COMING EVENTS

February 17
Detroit Rubber & Plastics Group, Inc.
Connecticut Rubber Group.

February 21
Elastomer & Plastics Group, Northeastern Section, American Chemical Society. Science Park, Boston, Mass.

February 24
Quebec Rubber & Plastics Group. Ladies Night. Victoria Hall, Westmount, P.Q., Canada.

March 7
The Los Angeles Rubber Group, Inc.
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

March 10
Chicago Rubber Group. Furniture Club, Chicago, Ill.

March 17
Boston Rubber Group. Hotel Somerset, Boston, Mass.

March 23
Quebec Rubber & Plastics Group.

March 24
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.

April 4
The Los Angeles Rubber Group, Inc.

April 6
Akron Rubber Group.
Rhode Island Rubber Club.

April 18-21
Division of Rubber Chemistry, American Chemical Society.
Brown Hotel, Louisville, Ky.

April 19
Quebec Rubber & Plastics Group.

April 21
Detroit Rubber & Plastics Group, Inc.

April 28
Chicago Rubber Group. Furniture Club, Chicago, Ill.

May 2
The Los Angeles Rubber Group, Inc.

May 12
Buffalo Rubber Group. International Meeting. Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

May 19
Connecticut Rubber Group.

May 21-30
American Chemical Society. St. Louis, Mo.

June 1
New York Rubber Group. Outing. Old Cider Mill Grove, Union, N. J.

June 2
Quebec Rubber & Plastics Group. Golf Outing. Ste. Hyacinthe, P.Q., Canada.

June 13
Buffalo Rubber Group. Outing. Lancaster Country Club.

June 16
Akron Rubber Group. Firestone Country Club.
Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 23
Detroit Rubber & Plastics Group, Inc.

June 23-24
Southern Rubber Group. Buena Vista Hotel, Biloxi, Miss.

August 3-5
Chemical Institute of Canada. Canadian Chemical Conference and Exhibition. Montreal, P.Q., Canada.

August 4
Division of Rubber Chemistry, Chemical Institute of Canada. Conference. Montreal, P.Q., Canada.

August 10
New York Rubber Group. Golf Outing. Scotch Plains and Echo Lake Country Clubs.

September 3-8
American Chemical Society, Chicago, Ill.

September 5-8
Division of Rubber Chemistry, ACS, Hotel Sherman, Chicago, Ill.

September 9
Connecticut Rubber Group. Outing.

September 29
Akron Rubber Group.

October 5
Detroit Rubber & Plastics Group, Inc.

October 10
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 13
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 20
New York Rubber Group, Henry Hudson Hotel, New York, N. Y.
Akron Rubber Group.

November 17
Connecticut Rubber Group

December 8
Detroit Rubber & Plastics Group, Inc.

LOOKING FOR A

HOT

General-purpose SBR?

TRY 1061 . . .

It's an easy processing non-staining, non-discoloring polymer, stabilized for maximum resistance to breakdown and gel formation during milling . . . especially suited for light-colored and white products such as white sidewalls, soles, tile, toys, proof goods and sporting goods. (Also, ask about 1061C, the preferred polymer for high impact styrene.)

Description:

Polymer . . . . . SYNPOL 1061
Emulsifier . . . . . Fatty Acid
Stabilizer . Non-staining, Non-discoloring
Coagulant . . . . . Salt Acid

SPECIFICATIONS

Chemical:

Volatile Matter, % wt. . . . . 0.50 max.
Ash, % wt. . . . . 1.50 max.
Organic Acid, % wt. 4.00-6.00
Soap, % wt. . . . . 0.75 max.
Bound Styrene, % wt. 22.5-24.5
Stabilizer, % wt. . . . . 1.25 added

Physical:

Raw Viscosity, ML-4 @ 212°F 44-52
Compound Viscosity,
ML-4 @ 212°F . . . . . 73 max.
Tensile Strength,
50′ Cure @ 292°F . . . . . 2500 min.
Elongation,
50′ Cure @ 292°F, % . . . . . 500 min.
Modulus @ 300% Elongation, psi
25′ Cure @ 292°F 325-625
50′ Cure @ 292°F 750-1100
100′ Cure @ 292°F 1200-1600

Test Recipe:

SYNPOL 1061 . . . . . 100.00
EPC Black 40.00
Zinc Oxide 5.00
Sulfur 2.00
MBTS 1.75

. . . one of the reliable

SYNPOL®

SBR'S

news from abroad

Argentine to Get SBR, Chemicals, and Carbon Black Facilities

A group of five United States corporations has been given permission by the Argentine Government to construct a $70-million facility for the production of SBR and petrochemicals in the northern industrial region of Argentina. At the same time, Cabot Corp., Boston, Mass., has also received approval to build a carbon black plant in the same area. Between them, they will supply the country's present and future needs of SBR, rubber chemicals, and carbon blacks.

The five corporations, Cities Service Co., Continental Oil Co., United States Rubber Co., Witco Chemical Co., and Fish Engineering Corp., have formed a subsidiary, Petroquimica Argentina S. A., of which Fish holds 15% of the shares, Continental Oil, Cities Service, and U. S. Rubber, 24%, and Witco Chemical, 13%. The actual job of building will be handled by Fish; while the technical know how will be supplied by the other four partners.

The facility will be built at San Lorenzo, about 250 miles northwest of Buenos Aires. This is the site of the Argentine State oil agency's refinery, from which certain raw materials will be obtained. Distillate, propane, butane, and carbon black feedstock will come from the agency's oil and gas fields and plants in the Campo Duran area in northern Argentina near Boliva. The materials will be transported over two pipe lines built by Fish Engineering.

The nine-unit project will produce about 35,000 tons of SBR and 10,000 tons of polybutadiene rubber per year. Ultimately, in order to supply the country's expanding plastics industry, it will also produce caprolactam, dodecylbenzene, propylene, ethylene, plasticizers, and other products.

The facility will provide a yearly output of 32,000 tons of butadiene and 14,000 tons of styrene to produce SBR, plus 11,500 tons of anti-oxidants to be manufactured by U. S. Rubber. Also to be produced are 850 barrels a day of benzene, 8,800 barrels of motor fuel and 1,300 barrels of alkylate.

Originally Fish Engineering and Texas Butadiene were both seeking permission to build rubber facilities in Argentina. But as the Argentine Government felt that only one project was necessary to supply the country's rubber needs, and that it should be located in the underdeveloped southern region rather than in the more industralized northern area, Texas Butadiene was given the right to go ahead with its plan. The plant was to be built in two stages, with butadiene being shipped in until local gas fields could provide the raw material. When the government failed to build a promised 123-mile pipeline and a dam for water, the company was forced to abandon its project. Also, political unrest in the province resulted in suspension of the governor with whom the company had been negotiating, and the government did not like Texas Butadiene's proposal to import butadiene even though a local supply could not be guaranteed for some time.

Cabot's subsidiary, Cabot Argentina S. A. I. C., will have an output of 30 million pounds per year of carbon black at its plant in Campana. It will produce a complete range of oil furnace blacks, including its new low structure Regal blacks, and HAF, ISAF, FEF, and GPF blacks.

In a third development, Koppers Co., Inc., Pittsburgh, Pa., has announced that it is going ahead wtih plans to build a styrene plant at its La Plata complex. Whatever styrene is not used for SBR will be used in Koppers' and Monsanto Chemical Co.'s polystyrene plants or sold to local producers.

Nylon 12 Discovered

Chemische Werke Huls, West Germany, is working on development of a Nylon 12, discovered accidentally at the Max Planck Institute for Carbon Research while experiments were being made in polymerizing butadiene with the use of Ziegler catalysts.

The researcher, G. Wilke, while polymerizing butadiene, observed the formation of a fluid, low molecular byproduct. By changes in test conditions, the new substance was obtained as the main product. It proved to be cyclododecatriene 1,5,9, a trimer of butadiene.

Further reactions gave cyclododecane, from which the researchers derived dodecanolactam, the raw material for Nylon 12. Researchers also developed from cyclododecane a dodecandiacid, whose esters have properties as a plasticizer or lubricant.

The new Nylon 12 is expected to be a valuable material for fibers and molded products, since it has some properties claimed to be superior to those of Nylon 6 and Nylon 11.

Russians Mechanizing

Russian rubber and chemical works are speeding up mechanization and automation efforts in order to increase production, representatives of factories and scientific institutes reported at a conference of the rubber section of the D. I. Mendeleev All-Union Chemical Society in Moscow, according to an article by M. V. Potemkina in the July issue of *Soviet Rubber Technology*.

The Scientific Research, Design & Engineering Institute of the tire industry intends to introduce automatic weighing methods to control cycle of material supply and mixing from control desks, as part of methods for preparing stocks for a standard factor with annual capacity of 2-2.5 million tires. Data from the plan for the Dnepropetrovsk tire works, designed and equipped by a British consortium, were used as basis for the plan.

The Institute was also completing plans for two flow lines for vulcanizing automobile and truck tires, aiming at automation and complete synchroniza-

tion of production including supply of unvulcanized tires, lubrication of inner surfaces, placing tires on a suspension conveyor, loading and unloading presses, trimming flash, painting the outside of tires.

At the Yaroslavl tire works, an experimental device which automatically weighs free-flowing materials on remote-control scales has been mounted on a single internal mixer, allowing single-stage preparation of normal formulas and rapid changeover from one recipe to another.

At the tire works new 400 by 400 mm. two-platen presses and 600 by 600 mm. four-platen presses are equipped with a compact hydraulic drive of Czechoslovakian design, by which vulcanizing temperature can be raised to 250° C. and over, and platen temperature is automatically controlled. A rotary automatic transfer molding vulcanizer has been designed for producing reinforced and non-reinforced mechanical goods.

The "Red rubber worker" factory at Kiev, in order to fill its quota in four instead of seven years, is mechanizing and automating processes and will install horizontal screw injection molding presses and semi-automatic turntable transfer molding vulcanizers. The Red Triangle works has designed continuous apparatus for vulcanizing stamped galoshes in hot air without excess pressure, and a Czechoslovakian press has been introduced to cure boots on cores with elastic airbags.

At a number of factories high-frequency current is employed to decrystallize natural rubber. According to plans, tires will be preheated with high-frequency current prior to curing.

According to the article, reports showed the absence of the requisite degree of coordination in the work of factories, research institutes, and planning bodies, that machinery and rubber factories were slow in developing new designs, and that organization of technical information was poor.

Conference Proceedings

The Rubber Research Institute of Malaya is now ready to accept orders for the printed proceedings of the Natural Rubber Research Conference, Kuala Lumpur, Malaya, 1960, scheduled to appear early this year.

It will be recalled that 80 scientific and technical papers were presented on the production, preparation, and use of natural rubber. These, fully illustrated, are now to be printed and bound (in Rexine) in a single volume of more than 1,000 pages, which will also include the lectures by the guest speakers, Professors Blackman, Bonner, and Gee; the final summary by Sir Geoffrey Clay; discussions; and a list of the participants. The price outside of Malaya will be about $7.50 (U. S. currency), plus additional charges for postage and handling of $2.00 (Malayan) for book post, or $5.00 (Malayan) for parcel post.

CAC R&D Plans

Details of decisions relating to rubber research and development made at the first official meeting of the Coordinating Advisory Committee (CAC), held in London during last October, were recently released by the Controller of Rubber Research, Sir Geoffrey Clay.

The CAC meets in London and advises the Malayan Rubber Fund Board on scientific matters. It set up three steering committees to consider estimates and programs of the Natural Rubber Producers' Research Association, Natural Rubber Bureau, and the Rubber Research Institute of Malaya. It suggested—and the Malayan board agreed—that the NRPRA should intensify work on blends of natural rubber and synthetic rubber, further research was also recommended on oil-extended rubbers. It was pointed out that 30% extension was possible with synthetic rubber; whereas the present percentage for natural rubber was only 10-20%.

The American member of CAC, Dr. W. Cake, United States Rubber Co., offered 21 projects for consideration, many of which, however, had already been taken up in Malaya and London. Dr. Cake also reported that he had succeeded in getting leading American manufacturers to agree to try out new rubbers and modified natural rubbers, with the proviso that a reasonable amount of material—say 200 pounds—would be provided.

Changes decided on include: absorption of Rubber Technical Developments, Ltd., by NRPRA; taking over by E. Jago, London representative of the Malayan Rubber Fund Board (MRFB) of an advisory committee in London, responsible for assisting the RRI of Malaya, in engaging staff, and other matters; preparation of amendments to the RRI ordinance, by an MRFB sub-committee which provide that the responsibility for the research program be left to the director. Since this program will entail more work than one man can handle, it is hoped that a permanent management committee will be appointed, especially to relieve the director of much routine administration. Sir Geoffrey added that he wished the new director—expected to arrive shortly—to be free to discuss various problems with the industry and other research organizations, to visit the United States when necessary, and to consider needed developments and changes in the research program.

The CAC also decided to dispense with the services of W. Lockwood as advisor to the Natural Rubber Bureau in Washington and temporarily to cut out advisory work in Canada and South Africa.

The program for the RRI Smallholders' Advisory Service calls for 200 rubber instructors in 1961 increasing to 300 by 1963 which, as Sir Geoffrey underlined, would give a rate of one instructor to 5,000 acres, instead of one to 20,000 acres, as was the case when he arrived in Malaya. The MRFB will

(Continued on page 121)

LOOKING FOR A

COLD

Oil-extended SBR?

TRY 1712...

It's one of the best general-purpose cold, oil-extended polymers. Its balance of economy and good performance properties makes it ideal for such general-purpose applications as tires, tread rubber, molded and extruded mechanical goods.

Description:

Polymer	SYNPOL 1712
Emulsifier	Mixed Acid
Stabilizer	Staining
Coagulant	Salt Acid
Oil	HI-AR

TENTATIVE SPECIFICATIONS

Chemical:

Volatile Matter, % wt.	0.75 max.
Ash, % wt.	1.50 max.
Organic Acid, % wt.	3.90-5.70
Soap, % wt.	0.50 max.
Bound Styrene, % wt.	22.5-24.5
Stabilizer, % wt.	1.25 added

TYPICAL PRODUCTION VALUES

Physical:

Compound Viscosity, ML-4 @ 212°F.	46
Tensile Strength, 50′ Cure @ 292°F, psi	3175
Elongation, 50′ Cure @ 292°F, %	730
Modulus @ 300% Elongation, psi	
25′ Cure @ 292°F	275
50′ Cure @ 292°F	675
100′ Cure @ 292°F	975

Test Recipe:

Polymer	100.00
EPC Black	40.00
Zinc Oxide	5.00
Sulfur	2.00
MBTS	2.00

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Can Grow Old Gracefully too

HARCHEM SEBACATE PLASTICIZERS WILL GIVE YOURS THIS UNIQUE QUALITY

Extend the life and the original looks of your products and you build customer good will that reflects itself in greater sales and profits. Nothing will give them more stability, more protection against the inroads of age than Harchem Sebacate Plasticizers. Whether you seek resistance to heat, cold, water, weather or physical abuse, the key to your problem can be found in the chart of four Sebacic Acid Esters found below.

Plasticizer	Specific Gravity 25°/25°C ±.003	Viscosity 25°C, cps	Compatible With	Outstanding Characteristics
Dibenzyl Sebacate	1.055	21-22	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers	Excellent Solvation, Very Low Volatility, Permanence, Good Electricals, Low Temp. Flexibility
Dibutyl Sebacate	0.935	7.9	Vinyl Resins, Cellulose Acetobutyrate, Synthetic Rubbers, Rubber Hydrochloride, Polymethyl Methacrylate	Low Temp. Flexibility, Excellent Aging Qualities, Non-Toxic
Dimethyl Sebacate	0.986*	3.54 @30°C	Vinyl Resins, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate, Acrylic Resins	High Solvency and Efficiency, Wide Compatibility, Concentrated Source of Sebacyl Radical
Dioctyl Sebacate	0.913	17.4	Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate	Excellent Low Temp. Flexibility, Low Volatility, Excellent Soapy Water Resistance, Good Electricals

*30°/20°C

Columbian Carbon Company, Distributor To The Rubber Industry

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WRITE FOR BULLETIN OR CONSULT
CHEMICAL MATERIALS CATALOG PAGES 159-161

news from abroad

(Continued from page 119)

spend $12,778,500 (Straits currency) on research and development during 1961 out of £12,909,500 that will be available.

In line with the reorganization of research and development in the natural rubber industry, the Natural Rubber Bureau—which is financed by the industry—plans to extend technical advisory service to Pakistan, India, Borneo, Brunei, Sarawak, and Hong Kong. Consumption of rubber in these areas, although still relatively small, has risen sharply in recent years so that it is thought to be vitally important to the promotion of natural rubber to provide technical information to local manufacturers. The Bureau is studying consumption patterns in Asian countries so as to gain an insight into their technical requirements.

India Ups Tire Output

India plans to more than double its tire production by 1965, according to the year-end report of the Association of Rubber Manufacturers in India. Under the III Five-Year Plan automobile tire production will go from 1.4 million in 1959 to an estimated 3.7 million in 1965. Cycle tire production is expected to jump from 14.5 to 38.6 million. By 1965 licensed tire plants should be in operation at Bombay, Madras, Calcutta, Delhi, and Kerala.

Natural rubber consumption rose from 37,332 tons in the October, 1958/September, 1959, period to 42,805 tons in the October, 1959/September 1960, segment. Synthetic rubber consumption rose to 5,878 from 4,028 tons in the same periods. Raw and synthetic rubber imports amounted to 18,437 and 5,152 tons, respectively, according to the Association report.

A new company was formed to manufacture synthetic rubber, and work is progressing at Bareilly, in Uttar Pradesh, the site of the new plant. Reclaim rubber consumption has been 5,152 tons, part of which was reclaimed at the works of three major firms and the rest imported. The Indian Government granted licenses to Phillips Petroleum International Corp. and Continental Carbon Co. (Witco Chemical), both of the United States, to set up carbon black plants. While most of the valves for automobile and cycle tires are imported, steps are being taken to make the industry self-sufficient in this item.

Rayon and nylon yarn for tire cord continued to be imported. National Rayon, Century Rayon Mills, both of Bombay, and the Delhi Cloth & General Mills, Delhi, have received licenses for rayon yarn manufacture. Only National Rayon, however, has a program for the conversion of yarn into cord.

Malayan Export Duties

Further details have been published on the new rubber export duties which went into effect on January 1, 1961.

When the price of rubber is 60¢ and under per pound, the duty works out at 4% ad valorem; above 80 cents per pound (Straits), the rate is gradually increased until it comes to about two cents per pound more than the 1960 rate. Above $1.00 (Straits) the rise is steeper so that with a price of $1.50 per pound, for instance, the duty will be 37⅜ cents instead of 22½ cents as formerly. For calculating the duty, three formulas have been published with the third formula quite fearsomely fascinating and applying when the price goes above $1.00. Thus, the first formula for prices between 60-80 cents is 0.18625 of the price, less 8.775 cents; at 80 cents to $1.00, the second formula is 0.40 of the price, less 25.75 cents; but when the price is above $1.00, we run into algebra, then the formula is:

$$0.25x^2+3.375x+14.25$$

where: $x=\frac{\text{price}-100}{10}$

Fortunately, duty may be calculated to the nearest eighth of a cent.

Radioactive Isotopes For Rubber Research?

Upon two occasions in the recent past, reference was had in the press to actual and possible use of radioactive isotopes in rubber research by the Rubber Research Institute of Malaya.

In April, 1960, the *Straits Times* stated that the RRI in Kuala Lumpur had started to use radioactive isotopes to discover their effects on stimulation of rubber trees; it also noted that the biochemistry department of the University of Malaya in Singapore reportedly had obtained equipment for tests with radioisotopes. In September, 1960, the *Malay Mail* quoted Dr. R. C. H. Hsia, of the RRI analytical section, as saying that he had requested a laboratory to conduct research on latex with the aid of radioactive materials, which he was said to feel would help throw additional light on the action of copper and manganese in latex, for instance. It would be interesting to learn whether the new research program will include such investigation.

Pelletized News

CHEMISCHE WERKE HULS, Germany, plans to begin large-scale production of polybutadiene in a plant with yearly output capacity of 20,000 tons, soon to be erected.

(Continued on page 132)

LOOKING FOR A

BLACK

Oil-extended Masterbatch?

TRY 8255...

It features 50-part oil extension for economy, plus a quality furnace black for good appearance and high abrasion resistance... teamed up for quality and service in such general-purpose applications as tires, tread rubber, hose, belting, and other mechanical goods.

Description:

Polymer	Type 8202
Emulsifier	Mixed Acid
Stabilizer	Staining
Coagulant	Acid
Oil	HI-AR
Carbon Black	HAF

TENTATIVE SPECIFICATIONS

Chemical:

Volatile Matter, % wt.	1.00 max.
Ash, % wt.	0.50 max.
Organic Acid, % wt.	3.25-4.75
Soap, % wt.	0.50 max.
Bound Styrene, % wt.	22.5-24.5
Stabilizer, % wt.	1.25 added
Carbon Black, % wt.	32-34.6

TYPICAL PRODUCTION VALUES

Physical:

Compound Viscosity, ML-4 @ 212°F	54
Tensile Strength, 50′ Cure @ 292°F, psi	2900
Elongation, 50′ Cure @ 292°F, %	620
Modulus @ 300% Elongation, psi	
25′ Cure @ 292°F	625
50′ Cure @ 292°F	1200
100′ Cure @ 292°F	1600

Test Recipe:

SYNPOL 8255	150.00
Zinc Oxide	5.00
Sulfur	2.00
MBTS	1.00

Yes we've got them all... over 30 distinct types of SYNPOL... one for practically every purpose. Hot, cold and cold oil-extended... light-colored, non-staining... commercially proved, ultra-dispersed, mechanically mixed masterbatches. You name it... we've got it.

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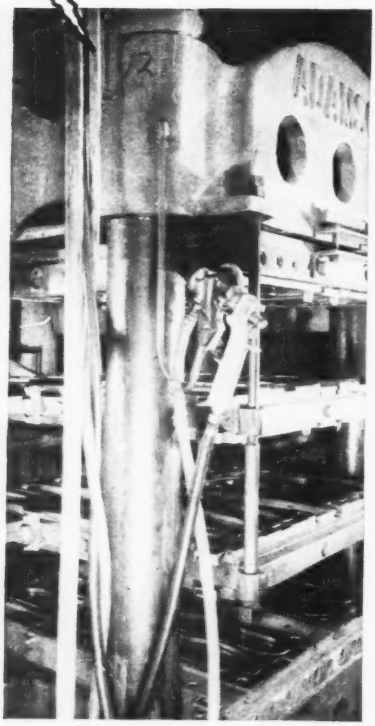
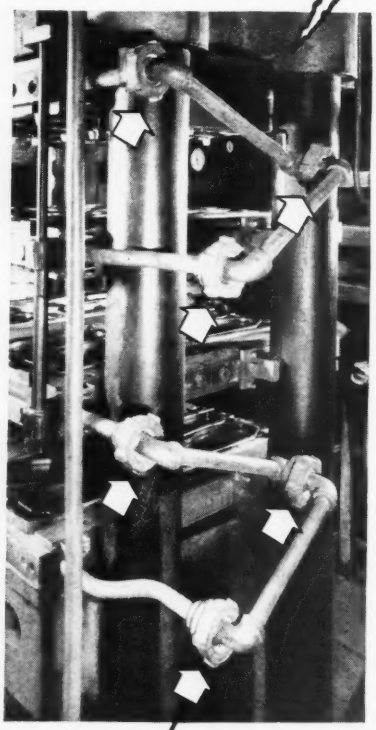
TEXUS Research Center: Parsippany, N. J.

Leaky Steam Connectors Caused Press Shut-Downs . . .

These "Dog Legs" Ended The Trouble!

(Installation: B. F. Goodrich Footwear and Flooring Company, Watertown, Mass.)





User installs **BARCO**

"Self-Aligning" SWIVEL JOINTS

PROBLEM—Because non-rigid steam connectors were subject to aging, fatigue failure, and blow-outs, maintenance workers in this rubber plant had to shut down presses repeatedly for repairs. *Production suffered, operators stood idle, and costs mounted.*

ANSWER—Plant personnel decided to change over to pipe "dog legs" fitted with Barco Swivel Joints, as shown above at the right. The first installation was made over three years ago and has operated without trouble. Barco Type S Swivel Joints WITH NEW 11 CTS TEFLON SEALS stays tight for years without leakage and with no danger of blow-outs. Pipe fitting is easy because of the self-aligning feature of Barco Swivel Joints. *For complete information, see your nearest Barco representative or write.*

FOUNDED 1908 BARCO "PRODUCTS BACKED BY EXPERIENCE"

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510C Hough Street, Barrington, Illinois

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Rotary Joints

In Canada: The Holden Co., Ltd., Montreal

ADVANTAGES

1. SAVE MONEY! CUT COSTS—Barco's new No. 11CTS gasket is amazingly long wearing! Does not bake hard. Ideal for steam and water service. Does not cause excess wear on other parts.

2. HOT OR COLD—Joints stay tight regardless of pressure or temperature.

3. SELF-ALIGNING—10° side flexibility. This Barco feature saves piping time, cuts costs, and insures perfect performance.

4. ENGINEERING RECOMMENDATIONS—Send for a copy of Catalog No. 265C and installation drawing 10-52004.

SEND FOR CATALOG 265C

obituaries

Kenneth C. Crouse, Sr.

Kenneth C. Crouse, Sr., sales executive for J. M. Huber Corp., New York, N. Y., died of leukemia on January 5 in New York, N. Y. He resided at Scarborough-on-Hudson, N. Y.

Mr. Crouse joined Huber's industrial products department in 1950 and served as assistant divisional manager of the rubber division from 1951 until his death. Previously he had been vice president and sales manager for Warren McArthur Corp. for 17 years. Mr. Crouse was a director of the Connecticut Rubber Group. He was also president of Mayfair Industries, Inc., a family company.

He was born on December 3, 1903. He attended Randolf-Macon College.

Funeral services were held January 7 at St. Marys Episcopal Church, followed by burial at Sleepy Hollow Cemetery, both in Scarborough-on-Hudson.

The deceased is survived by his wife, a son, two daughters, a sister, two brothers, and four grandchildren.

Jack L. Krauss

Jack L. Krauss, former sales manager of the Aldan Rubber Co., Philadelphia, Pa., passed away at his home in Philadelphia, December 30.

While actively associated with Aldan, Krauss was also a vice president of Schwarzwaelder Co., Philadelphia fabric technicians and specialists. He retired from his position as sales manager of Aldan in 1958, but remained active as a director of the company until his death.

He was born in Savannah, Ga., 75 years ago.

The deceased is survived by a wife and a son.

Burial was from the Oliver Bair Funeral Home, Philadelphia, on January 1.

Ellis Phreaner

Ellis Phreaner, well-known consulting rubber chemist, died December 28 at Santa Ana, Calif.

The holder of many patents in the rubber and plastics field, Mr. Phreaner was full-time consultant for Stoner Rubber Co., Anaheim, Calif., for the past five years. His recent activities were improvements in silicone modified rubbers for use as barriers and insulation materials in the rocket and missile industries. Prior to that assignment he had worked for Goodyear Tire & Rubber Co. and Bettis Rubber Co., Whittier, Calif., and had done original research at the Tonowanda laboratories of Union Carbide Corp., New York, N. Y.

(Continued on page 132)

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WEST POINT TEXTILES

Rayon-Nylon Tire Cord War Shifts Battle Line From Price to Quality

Rayon and Nylon

The tire cord war between rayon and nylon appears, at least temporarily, to have shifted from price to quality.

Industrial Rayon Corp., Cleveland, O., announced that it is ready to put into production a new rayon tire yarn with 10% greater tensile strength than present yarns used for tire cord.

The company said it had no information on properties of the yarn other than tensile strength, such as fatigue resistance, adhesion, heat resistance, etc., but it was reported that fatigue resistance of the yarn is substantially the same as that of present yarns.

The announcement followed by about a month the marketing of an improved nylon yarn by Chemstrand Corp. The yarn, according to Chemstrand, has double the fatigue resistance of other nylon tire yarns.

Meanwhile, nylon tire cord made two advances last month when Corduroy Rubber Co. announced complete switchover to nylon cord in all of its tire lines, and Seiberling Rubber Co. switched to use of nylon in both its front and rear tractor tires. Corduroy said it was making the change because its nylon cord tires did 90% of sales during 1960.

While the nylon and rayon battle is raging, development of other synthetics is still going on. E. I. du Pont de Nemours & Co., Inc., is still working on its HT-1, a polyamide (the same fiber family as nylon) which melts at 600° F. compared with 482° for nylon, and Air Reduction Chemical Co. is planning to introduce Vinal FO, a poly(vinyl alcohol) fiber developed in Japan by Kurashiki Rayon Co. One of the main advantages of the fiber for tire cord, it is understood, is its high-temperature qualities. In Germany, furthermore, Chemische Werke Huls is working on a Nylon 12 which may have tire cord possibilities.

Although new advances in tire manufacture may require improvements in tensile strength, most of the research in synthetic fibers at this point is for improvements in qualities other than tensile strength, such as fatigue resistance, heat resistance, and adhesion.

Along that line, studies made by Soviet technologists recently are of interest. In an article by R. V. Uzina and V. E. Basin, reported in the July issue of Soviet Rubber Technology, it was found that failure in tire-cord systems does not occur at the cord-adhesive interface, but at the adhesive-rubber interface. It was suggested that bond strength be improved by introducing into the latex used for adhesives substances with polar functional groups such as albumin resins, using latices with active functional groups such as carboxylated or vinylpyridine latices, or introducing active components into the rubber. Tire cords tested included Nylon 6 (Nylon 6 and Nylon 66 are the nylons most used for tire cord), viscose, cotton, and polyamide monofilament. Rubbers used were natural rubber, sodium polybutadiene, polyisoprene, and oil-extended SBR. Latices used included SBR, polybutadiene and methylvinyl pyridine, and carboxylated SBR.

Figures in the January issue of *Textile Organon* showed poundage of rayon and acetate in tire cord and cord fabric declining from 306.8 million pounds in 1954 to 269.7 million pounds in 1959; while nylon sales were going up from 27.1 million pounds in 1954 to 109.9 million pounds in 1959. Cotton declined from 12.8 million pounds in 1954 to 3.1 million pounds in 1959. Meanwhile rayon's share of the tire chafer fabric market was going up, from 0.5 million pounds in 1954 to 5.8 million pounds in 1959, and cotton's declining from 24.3 million pounds in 1954 to 7.3 million pounds in 1959.

Total tire use amounted to 307.3 million pounds for rayon in 1954 and 275.5 million pounds in 1959. For nylon the figures were 27.1 million pounds in 1954, 110.8 million pounds in 1959. Cotton use dropped off from 37.1 million pounds in 1954 to 10.4 million pounds in 1959.

Natural Rubber

The natural rubber market made slight gains during the December 16-January 15 period, but there was a large cloud on the horizon.

The cloud was the possibility of a fall strike in the auto industry, which would slow down spring orders of rubber and other materials for the auto plants. It would also inhibit third-quarter orders for delivery after Labor Day. The slowup this spring would not be for current production, but for customary buildup of inventories prior to production of 1962 models.

Present auto contracts expire August 31.

The rise in rubber prices during the

REX CONTRACT

1961	Dec. 16	Dec. 23	Dec. 30	Jan. 6	Jan. 13
Jan.	28.40	28.65	28.85	29.35	28.85
Mar.	28.60	28.85	28.90	29.60	29.00
May	28.75	28.95	29.00	29.50	28.85
July	28.80	29.00	29.00	29.50	28.85
Sept.	28.80	29.00	29.00	29.50	28.80
Nov.	28.75	28.95	29.00	29.45	28.70
1962					
Jan.	28.75	28.90	29.00	29.40	28.60

NEW YORK OUTSIDE MARKET

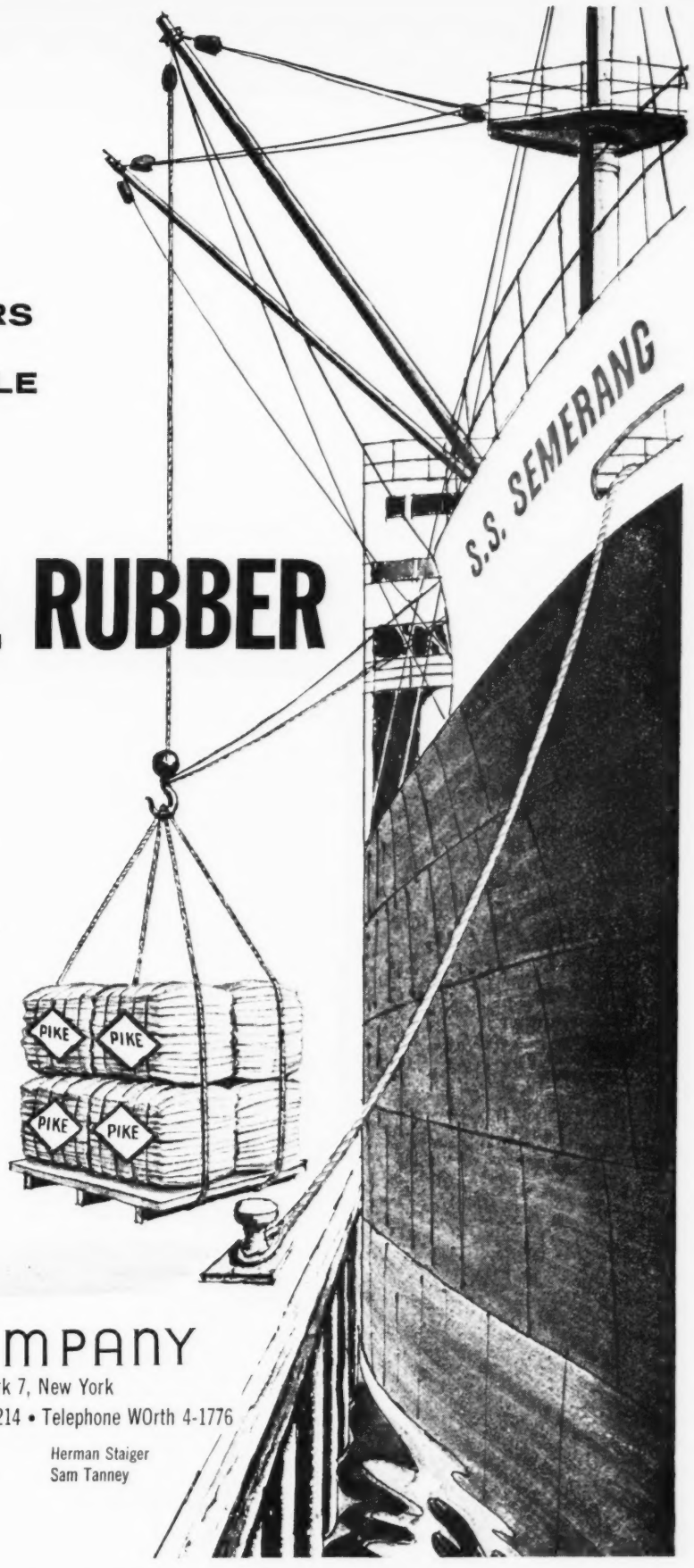
	Dec. 16	Dec. 23	Dec. 30	Jan. 6	Jan. 13
RSS #1	28.50	28.85	28.85	29.50	29.00
#2	28.37	28.75	28.75	29.37	28.85
#3	28.25	28.63	28.63	29.25	28.75
Pale Crepe					
#1 Thick	30.50	30.85	30.85	32.00	31.50
Thin	30.50	30.85	30.85	32.00	31.50
#3 Amber Blankets	25.25	25.63	25.63	26.25	25.50
Thin Brown Crepe	25.25	25.50	25.50	26.25	25.50
Standard Flat Bark	20.75	21.00	21.00	21.00	20.25

FOR 40 YEARS

A DEPENDABLE

SOURCE OF

NATURAL RUBBER



Importing Natural Rubber is about 95% of our total business. We make direct purchases in many foreign lands, including Ceylon, Malaya, Sumatra, Java, Borneo, Cambodia, Vietnam, Burma, Bolivia, Brazil, Nigeria, Belgian Congo.

Forty years experience in importing Natural Rubber. Specialized grades for particular uses.

SJP

S. J. PIKE COMPANY

30 Church Street • New York 7, New York

Cable address "Pikesid, N. Y." • TWX NY 1-3214 • Telephone WOrth 4-1776

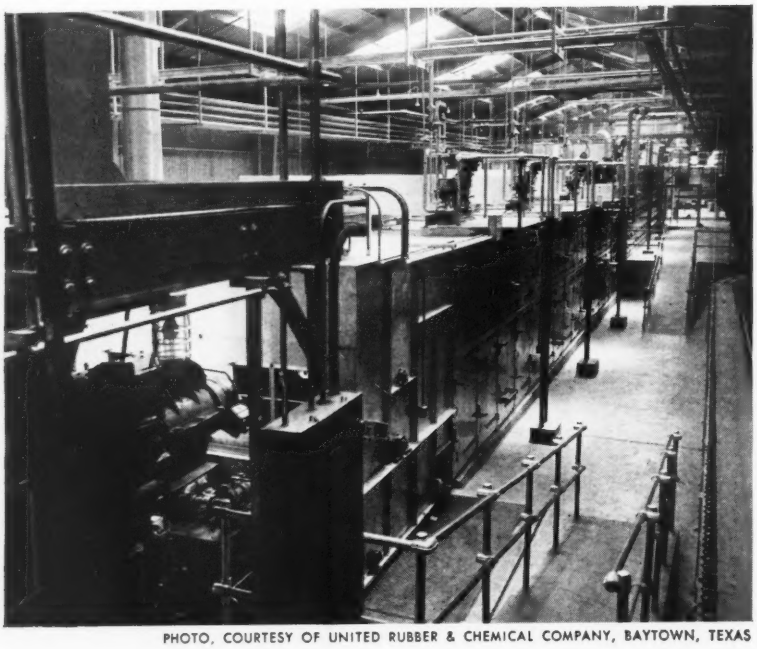
SALES DIVISION: Sidney J. Pike, George Steinbach, George Jatinen, Herman Staiger, Sam Tanney

Generally, there are three approaches by a company to the selection of a process dryer — the engineering, the economic, and the important evaluation of the intangibles. We firmly believe that SARGENT will always be found on top from every approach, for many reasons, an important one being that our machines and our people consistently deliver as promised, and more. This is the SARGENT:

- A dryer designed for your process, your required production.
- Rugged construction, trouble-free economical operation.
- Highest quality, measurably uniform drying.
- Exclusive features for efficiency and safety.
- Heat source — gas, oil, steam, electricity.
- A dryer designed for quick, easy cleanout.
- The bonus economy of the speediest, easiest installation of any machine on the market.
- Built by a company whose dryers lead the field — a company whose long experience makes a guarantee really mean something — a company that will say, "We stand unequivocally behind every machine we build."

FORMULA FOR PROFITABLE OPERATION

RUBBER DRYERS by SARGENT



PHOTO, COURTESY OF UNITED RUBBER & CHEMICAL COMPANY, BAYTOWN, TEXAS

SARGENT Single-Pass, Two-Stage Rubber Dryer

This 32-section, 2-stage master batch dryer, delivering large tonnage hourly, has a vibrating feeder, an extra-wide conveyor. Gas-fired, with each of six zones separately heated, regulated and controlled. No air recirculation through the heaters prevents contamination. Full-height hinged doors for ease of speedy, thorough cleanout. Completely automatic push-button operation and control. It meets fully the exacting, specified requirements of hourly production with complete automation, operating efficiency and the incorporation of every known safety device for the protection of personnel, machine and stock.

Another example of SARGENT advanced design and creative engineering in building a dryer that will be MODERN FOR YEARS TO COME.

C. G. SARGENT'S SONS CORPORATION

Graniteville, SINCE 1852 Massachusetts

PHILADELPHIA • CINCINNATI • CHARLOTTE • ATLANTA • HOUSTON • DETROIT
NEW YORK • CHICAGO • LOS ANGELES • TORONTO

market reviews

December 16-January 15 period was the first since prices began dropping in early July. The price of near rubber on the New York Commodity Exchange went from 28.26¢ a pound December 15 to 28.85¢ January 13, and the spot price of RSS #1 went from 28.50¢ to 29¢.

Although a portion of the rise in rubber prices was occasioned by an improvement in manufacturer orders at the beginning of the year, the major reason for the rise was probably the troubled situation in Laos, which caused sharp reactions in the Singapore market. When the expected explosion in Laos was not immediately forthcoming, however, prices began to slump again.

The rise was not considered especially significant for another reason. Analysts noted that in recent years the tendency of most commodities has been to rise in January and fall again in late winter. The January rise this year was much smaller than usual, pointing to a static or declining market for the next few months.

British analysts predict that prices will be depressed this year by a continuing oversupply of natural rubber. The United Baltic Corp. estimates 1961 production of natural rubber at 2,025,000 long tons, compared with consumption of 2,000,000 long tons. Estimated production includes 735,000 long tons from Malaya and 630,000 from Indonesia.

December sales on the New York Commodity exchange totaled 7,390 long tons contrasted with 12,340 long tons during November. There were 21 trading days in December and 19 in the December 16-January 15 period.

On the physical market, according to the Rubber Trade Association of New York, RSS #1 averaged 28.76¢ a pound in December and 29.13¢ in the November 16-December 15 period, compared with 30.67¢ in November and 29.17¢ for the November 16-December 15 period.

Synthetic Rubber

A new process for making isoprene monomer from isobutylene and formaldehyde, developed by Institute Français du Petrole, is being licensed to Cities Service Co., New York, N. Y., and to three Japanese firms, Mitsubishi, Nippon Gas, and Ube Kosan. The three Japanese firms are seeking government approval to go ahead with the process.

Contracts are also due to be signed with a second U. S. firm, unnamed, a French company, and a third firm. An existing French pilot plant with a capacity of 88 pounds a day will be replaced this year by a ton-a-day plant, it was reported.

Present U. S. plants use isoamylene or propylene to make isoprene. The advantage of the new process is that

(Continued on page 131)

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER

Great new advance in automotive rubber

Here is a new rubber that's unmatched for oil, weather, and abrasion resistance. It's new PARACRIL® OZO, the finest achievement yet in the nitrile rubber field. PARACRIL OZO's properties are tailor made for many modern automotive parts—for everything from weather stripping to oil seals and hose. PARACRIL OZO gives you a whole series of important advantages, including:

- significantly superior ozone resistance
- excellent fuel and oil resistance
- several times greater abrasion resistance
- permanent retention of bright colors for exterior styling and easily traceable wiring and other interior parts

Look into PARACRIL OZO. Discover for yourself its new design possibilities...its unlimited color...its high quality. Contact your nearest Naugatuck representative at the address below.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

US RUBBER

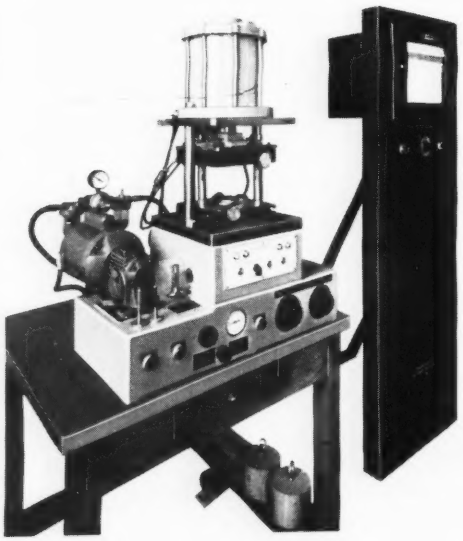
Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N. Y.

NEW PUSH-BUTTON ACCURACY FOR TENSILE TESTING!

Test tensile at high and low elongations, tear strength, adhesion, and other physical qualities of your rubber products on the versatile Scott Model CRE Constant-Rate-of-Extension electronic tester. New push-button controls make rubber testing a simple, accurate operation . . . offer greater-than-ever operating convenience and testing economies. Precise *electronic weighing* system provides a wide selection of test load ranges from 0.5 to 1000 lbs. . . . instant response to rapidly fluctuating loads. Multi-range Specimen Dimension Compensator also provides *direct-in-psi* readings for testing elastomeric stress.

The ratio of crosshead speed to recorder chart speed is adjustable over a wide range, giving ample magnification for practically all materials. Elastomer pipping circuit provides manually-controlled representation of visually-observed specimen elongation. A new Scott clamp-locking assembly also reduces clamp-changing time to a *matter of seconds!* The Model CRE makes use of *all* Scott clamps and fixtures to meet ASTM, ISO, government and rubber industry test methods.

SCOTT TESTERS FOR RUBBER



PUSH-BUTTON AUTOMATION FOR VISCOSITY TESTING!

Determine viscosity, scorch, and cure characteristics of rubber and other elastomers with the modern Scott Model STI Mooney Viscometer — now further improved with the new Scott Dual-Pen Electronic Recorder which records specimen temperature and viscosity in Mooney Units simultaneously on the same strip chart. *STI features:* (1) Pneumatic-powered controls provide a constant and uniform holding pressure to insure reliable and reproducible results — without effort or adjustments. (2) Temp. control within $\pm\frac{1}{2}$°F at any set temp. to 450°F. (3) Fast, easy calibration. (4) Fully enclosed gear box. (5) Less maintenance — less downtime. Scott Mooney Viscometers are universally accepted as meeting requirements of ASTM Designation D1646 (formerly D927 and D1077) and ISO/TC45 Draft ISO Recommendation No. 378 and Proposal No. 440.

QUICK-CHANGE SCOTT CLAMPS AND FIXTURES

Z-1 CLAMP FOR **TENSILE TESTING**

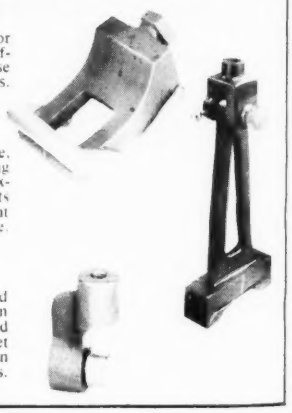
One of the industry's most popular clamps for general purpose rubber testing. This is a self-closing clamp developed by the Gas Defense Service, U.S.A. for testing gum and soft stocks. Roll is $\frac{3}{8}$" in diameter and $1\frac{3}{4}$" in length.

LORD **ADHESION** FIXTURE

Designed by the Lord Manufacturing Co., Erie, Pa., for evaluating rubber-to-metal bonding strength. Adaptable to Scott clamps, this fixture accepts a metal backing plate and pivots on a nylon bearing to insure positive alignment during stripping of 1" wide rubber sample. Meets ASTM Method of Test D-429.

RING TEST SPOOLS

This Scott clamp is used for testing ring-shaped rubber samples and loops of rubber thread on a sled base. Spools are ball-bearing mounted . . . lower spool with chain-driven sprocket revolves as strain is applied, for even tension on both sides of loop or ring. Capacity 150 lbs.



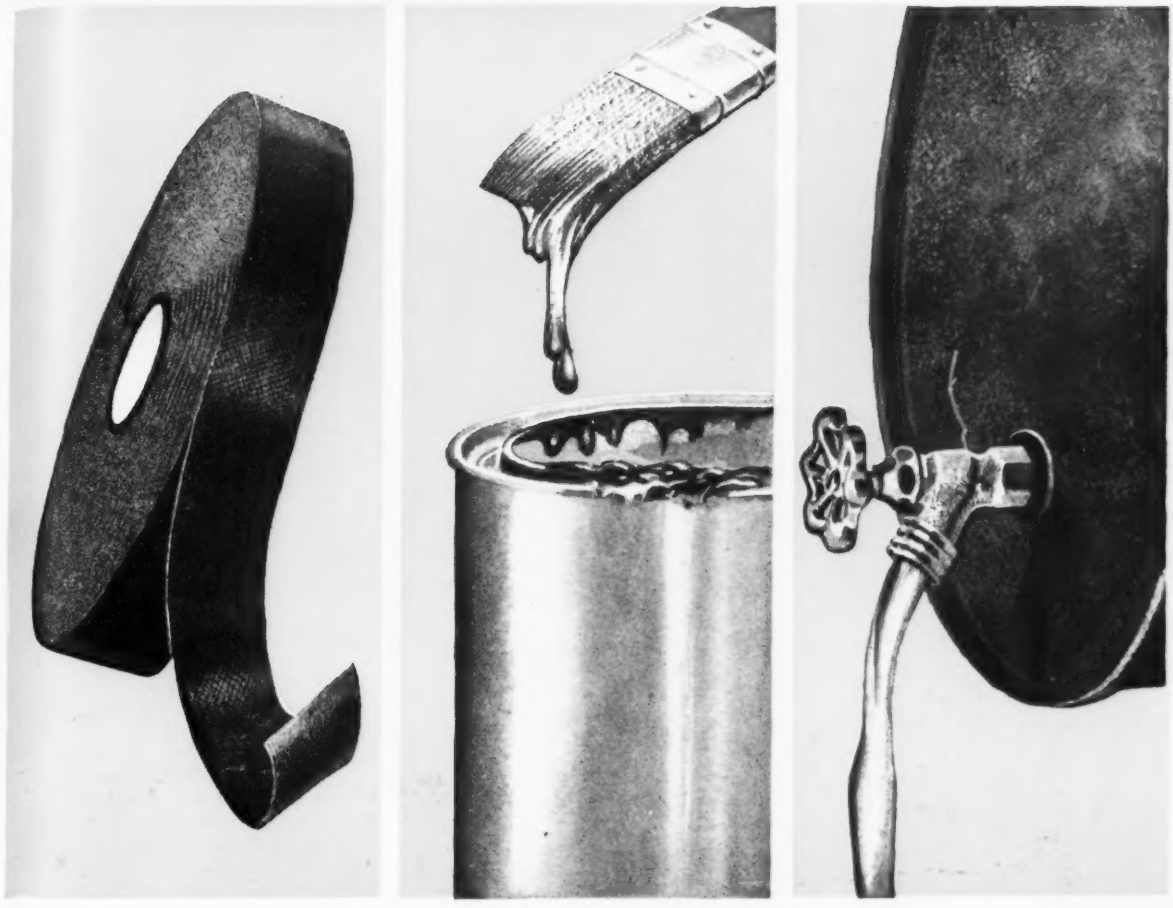
WRITE FOR COMPLETE DETAILS ON MODEL CRE . . . MODEL STI . . . SCOTT CLAMPS . . . AND OTHER SCOTT TESTERS DESIGNED FOR RUBBER AND ELASTOMER PRODUCTS

SCOTT TESTERS

THE SURE TEST . . . SCOTT!

SCOTT TESTERS, INC.
90 Blackstone Street
Providence, Rhode Island

Naugatuck RECLAIM



Investigate these advantages of **RECLAIM** for adhesives

In adhesive applications by the dozens, you can do the job at least as well, often better, and frequently *reduce your costs* by the use of Naugatuck Reclaimed Rubber especially processed for adhesive applications. Investigate these important advantages:

• Stable low cost • High uniformity • Shorter mixing time • Faster processing • Excellent aging characteristics • Good resistance to heat flow • Good sprayability • High stability • Good film tack • Good adhesion to a wide variety of materials, including metals, fabric and wood.

The variety of Naugatuck Reclaimed Rubbers available, including low-staining grades for such applications as pressure-sensitive tape, is fully described in Naugatuck's informative booklet, "Reclaimed Rubber." Send for your copy today.

Naugatuck Chemical

Division of United States Rubber Company 210B Elm Street Naugatuck, Connecticut

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

Naugatuck CELOGEN-AZ

By the World's Leader in Blowing Agents

Secret of Vinyl's New World of Sales

CELOGEN-AZ

CELOGEN®-AZ blown vinyl has gone high fashion...with the hand and drape of the very finest and most expensive kid leather.

CELOGEN-AZ, a specially developed chemical blowing agent gives vinyl sheeting a distinct new resilience, a new lightness, softness, and flowing flexibility that is making blown vinyl one of the fastest growing segments of the plastics industry. Alert manufacturers are capitalizing on blown vinyl's versatility for upholstery, luggage and handbags, ladies' coats and jackets, footwear, and an ever-increasing line of consumer and industrial applications.

CELOGEN-AZ imparts a uniformly fine cell structure with no undesirable side effects, no unpleasant odors. It may be used in extrusion, calendering, and spread-coating operations with complete processing safety. The consistently high quality of this product of the world's leader in chemical blowing agents has made it the outstanding such chemical for blown applications.

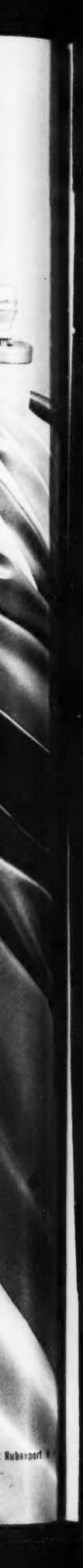
If you want to produce a finer, more salable vinyl product *and reduce your costs as well,* see your Naugatuck Chemical Representative or contact the address below.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · **CANADA:** Naugatuck Chemicals Division Dominion Rubber Co. Ltd. Elmira Ontario · **CABLE:** Rubexport



(Continued from page 126)

feed hydrocarbon can contain as little as 10% isobutylene.

The new process, as well as others still in the development stage, interests U. S. rubber producers because of the prospect that polyisoprene may eventually have to compete with 25¢-a-pound natural rubber. For most companies this would only be feasible if it were possible to obtain isoprene monomer at less than the current price of 25¢ a pound.

Consumption of new rubber in the United States during 1960 amounted to 1,555,111 long tons, against 1,627,770 long tons consumed in 1959, according to the monthly report of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber set a new record of 1,075,849 long tons in 1960, compared with the previous high of 1,072,726 long tons in 1959. Natural rubber consumption was 479,262 long tons, contrasted with 555,044 long tons in 1959.

Total new rubber consumption for December was 112,710 long tons, compared with 122,144 long tons in November.

Synthetic rubber consumption in December came to 81,155 long tons, contrasted with 86,179 long tons in November, and natural rubber consumption was 31,555 long tons, against 35,965 long tons in November.

The ratio of synthetic rubber to total new rubber consumption in the United States hit a new high of 72% in December, compared with 70.56% in November and the previous high of 70.57% in October. For the year the ratio was 69.18%, compared with 65.9% in 1959.

Production of synthetic rubber for 1960 set a new high of 1,436,524 long tons, against the previous high of 1,379,652 long tons in 1959. For December, production was 104,741 long tons, contrasted with 110,465 long tons in November.

A total of 342,074 tons of synthetic rubber was exported during 1960, compared with 290,468 long tons in 1959. For December the figure was 23,350 long tons; for November, 23,026 long tons.

Consumption of synthetic rubber (in long tons) by type in 1960 was: SBR, 901,306, against 886,275 in 1959; CR, 81,137, against 86,155 in 1959; IIR, 62,396, against 66,458 in 1959; NBR, 31,010, against 33,838 in 1959.

For December the figures were: SBR, 68,360, against 72,702 in November; CR, 6,065, against 6,372 in November; IIR, 4,280, against 4,455 in November; NBR, 2,450, against 2,650 in November.

Reclaimed Rubber

Reclaimed rubber business for the first two weeks of January indicates that sales for the month will run about 15% behind those of January, 1960, an Eastern reclaimer estimated.

Because of the Christmas holidays, business during the December 16-January 15 period was restricted mainly to the last two weeks, from January 3-15. Many factories were working only two weeks during the period, partly because of the holidays and partly because of inventory adjustments. For that reason sales during the period were about equal to or slightly lower than those of the November 16-December 15 period, an Eastern reclaiming company said.

A Midwest reclaimer reported that orders on hand seem to indicate that business will continue slow for some time.

Reclaimed rubber consumption was 278,894 long tons in 1960, compared with 290,410 long tons in 1959, according to the monthly report of The Rubber Manufacturers Association, Inc. For December, consumption was 20,050 long tons compared with 21,014 long tons in November.

Exports for the year were 13,919 long tons compared with 13,027 long tons in 1959. For December the figures were 1,100 long tons compared with 1,167 long tons in November. Imports amounted to 453 long tons for the year compared with 136 long tons in the preceding year.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.115
Third line	.1075
Inner tube, black	.17
Red	.22
Butyl	.17
Light carcass	.22
Mechanical, light-colored, medium gravity	.185
Black, medium gravity	.10

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

Scrap Rubber

A moderate amount of business, mainly of a routine nature, was done in the scrap rubber market during the December 16-January 15 period. The market was expected to continue quiet for several weeks.

Prices of mixed auto tubes declined from 4.25¢ to 4¢ a pound, and prices of butyl tubes dropped from 6.25¢ in the East and 6¢ in the Midwest to 5.75¢ in both markets.

	Eastern Points	Akron, O
	Per Net Ton	
Mixed auto tires	$7.00/$11.00	$11.00
S.A.G. truck tires	nom.	nom.
Peeling, No. 1	nom.	25.00
2	nom.	nom.
3	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	4.00	4.00
Black	5.75	5.75
Red	nom.	nom.
Butyl	5.75	5.75

In Vinyl Foam Coated Fabrics It's

CELOGEN®-AZ

For...Uniform Blow
...Uniform Quality
...Dependable Supply

Here is a typical starting-point formulation for calendering:

MARVINOL VR-31	100 parts
Dioctyl phthalate	70
Butyl benzyl phthalate	30
Stabilizer	3
CELOGEN-AZ	5
Stearic acid	0.5

Ingredients are preblended, Banbury-mixed and calendered using conventional equipment and techniques, excepting that stock temperatures are kept below 300° F. Expansion is accomplished by passing the sheet or laminate through an oven set at or above the blowing temperature of the compound, about 380° F.

For spread coating the following starting-point recipe is suggested:

MARVINOL VR-50 or VR-53	100 parts
Dioctyl phthalate	70
Butyl benzyl phthalate	30
Stabilizer	3
CELOGEN-AZ	4

Ingredients may be paint-milled or simply stirred in. Casting and lamination or direct coating can be done with conventional equipment. Fusion, lamination and expansion are accomplished simultaneously at 380-400° F.

The foregoing recipes and conditions are shown merely to illustrate the relative ease with which CELOGEN-AZ can be used to impart the advantages of cellular structure to coated fabrics and other vinyl laminates. Many variations and adaptations are possible.

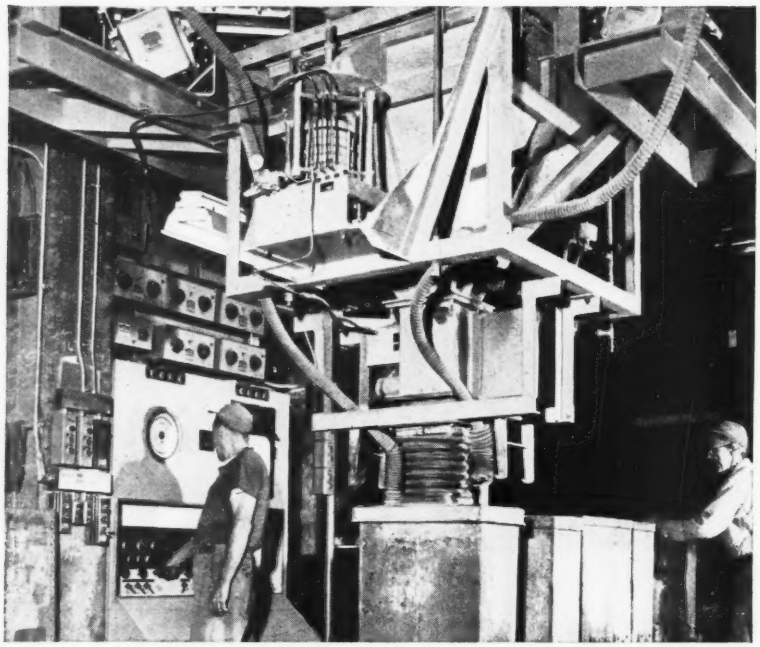
For more detailed information or discussion of a particular problem, call upon your Naugatuck Technical Representative.

Naugatuck Chemical

US RUBBER

Division of United States Rubber Company

AT CARBORUNDUM...



Accuracy and Instantaneous Control Response with W & C BATCH-WEIGHING SYSTEMS

Critical formulation standards are maintained at lower cost since Carborundum Company has introduced automatic batching of ingredients at their Perth Amboy, N. J. refractories manufacturing plant. The new automatic system—designed with W & C pre-engineered and laboratory-tested "building block" components—has greatly increased production, reduced labor costs, and decidedly improved the accuracy of batch weight control.

Chief reason for the accuracy of W & C Batch-Weighing Systems is the patented Uniforce flexural frame used in supporting both weigh-hoppers and weight transmitters. These unique flexural frames ensure accurate weighing under *all* load conditions, resolve *every* force and moment into a single vertical component applied to the load transducer.

Immediate response to control material flow in *any* batching operation is provided by the W & C Pneumatic Weight Transmitter, a force-balance instrument delivering a highly reproducible, (1 part in 2000) almost *instantaneous* signal directly proportional to net weight. No possibility of overshooting specified ingredient quantities. Practically no maintenance, compared with mechanical systems. The W & C scale is dynamically faster than a beam-and-balance or flexural beam system . . . W & C uses air, has no inertial mass to overcome . . . comes into balance sooner than a mechanical system.

For *consistently* accurate reproduction of bulk material formulations in any batching operation—single ingredient weighing to sequential multi-ingredient proportioning—you can depend on W & C.

WRITE FOR BULLETINS / Bulletin 30 fully describes W & C Batch-Weighing Systems
Bulletin 14 describes other W & C Automatic Weighing Systems

WC 100

CONVEYOR SCALE SYSTEM

CONSTANT-FEED WEIGH-HOPPER SYSTEMS

CHECK-WEIGHING SYSTEMS

CONTROL PANELS

Weighing & Controls, Inc.
Subsidiary of **CompuDyne Corporation**
Industrial Park, E. County Line Road, Hatboro 10, Pa.

market reviews

Latex

The liquid latex market continued slow during the December 16-January 15 period, with, however, a limited interest in the nearby and more forward positions.

The ratio of natural latex to synthetic latex consumed in the United States continued to drop during November. Of the 13,855 tons consumed in November, 9,700, or 70.01%, was synthetic latices, and 4,155 tons, or 29.99%, natural latex. In October the figure was 9,460, or 68.84%, synthetic, and 4,283 tons, or 31.16%, natural.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities f.o.b. tank car, dropped to 35.23¢ per pound solids, January 15, compared with 36.11¢ December 15. Synthetic latices prices were 26 to 40.24¢ for SBR, 37 to 57¢ for CR, and 45 to 60¢ for NBR.

obituaries

(Continued from page 122)

Paul P. McClellan

Paul P. McClellan, 55, staff associate in research administration for Jefferson Chemical Co., Inc., died of a heart attack, December 17, in Houston, Tex.

A native of Youngstown, O., McClellan was graduated from the University of Dayton with a B.S. degree; he received his Ph.D. degree in chemistry from Cornell University in 1933.

The deceased held various positions with Firestone Tire & Rubber Co., from 1933 to 1937, and with American Cyanamid Co., from 1937 to 1945, when he joined Jefferson Chemical.

Services were held December 21 at George H. Lewis & Sons, Houston.

Surviving are his wife, a daughter, a son, a sister, and two grandchildren.

Pelletized News

(Continued from page 121)

THE MALAYAN RUBBER RESEARCH INSTITUTE is testing a new method of increasing the yield of rubber trees, which consists in drilling holes into the trunks through which nutrition tablets are injected via a plastic tube. Nutrient deficiencies, always difficult to recognize, are now detected by analyzing leaves and latex of a suspected tree to determine its requirements, and the trees are injected with magnesium, potassium, phosphate, or other chemical, according to indicated needs. It is hoped this method will help to solve nutritional problems connected with latex precoagulation.

TOP QUALITY BECOMES ECONOMY AS KVP RELEASING PAPER IS USED AND RE-USED

KVP* Releasing Paper is in constant use at the Goodyear Tire and Rubber Company's plant in St. Mary's, Ohio. It is ideally suited to the handling of the highly-adhesive rubber products manufactured in this plant.

Below we see one of the steps in the production of diaphragms for industrial use. Layers of rubber are cemented together and assembled on trays covered with sheets of KVP Releasing Paper. Though extremely sticky on all surfaces, the rubber parts never cling to the releasing paper, even when weight-pressure mounts as the trays are stacked high. Nor does the paper shred, defibre or lint on to the rubber.

Yet, the high quality of KVP Releasing Paper becomes an *economy* for Goodyear because of its re-use factor. Not until the heat-treating stage is the KVP Releasing Paper discarded—then *only* because it becomes impractical to reclaim.

Most KVP Releasing Papers are tailor-made for a specific job. This is only one of many such papers produced by KVP Sutherland. It might meet your own needs. If not, we can almost certainly develop one for you that will.

We solicit the chance to solve your "sticky problems." Please write to Dept. RP3.

...the paper people

KVP SUTHERLAND PAPER COMPANY... Kalamazoo, Michigan

statistics of the rubber industry

U. S. Consumption of Natural And Synthetic Rubber*

(Long Tons)

Year	Natural	SBR	IIR	CR	NBR	Total
1960						
Jan.	46,354	78,891	6,093	7,361	2,788	141,487
Feb.	46,022	76,999	6,070	7,369	2,765	139,225
Mar.	47,205	81,065	6,324	7,693	2,645	144,932
Apr.	42,032	75,849	5,492	6,525	2,386	132,284
May	41,263	77,423	5,602	6,471	2,497	133,256
June	42,576	80,951	5,150	7,129	2,619	138,425
July	35,229	67,853	4,597	4,936	2,027	114,642
Aug.	37,528	73,761	4,880	7,200	2,737	125,836
Sept.	36,770	72,593	4,901	7,906	2,740	124,100

* Including latex.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U. S. Imports and Production of Natural And Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	CR	NBR	Total Synthetic	Natural and Synthetic
1960						
Jan.	5,339	9,720	1,154	1,131	12,005	17,344
Feb.	5,812	9,862	1,085	1,098	12,045	17,857
Mar.	5,127	9,351	1,004	1,217	11,572	16,699
Apr.	4,935	9,408	1,137	917	11,462	16,397
May	5,380	8,162	1,250	1,009	10,421	15,801
June	3,335	7,541	965	973	9,479	12,814
July	3,483	6,481	953	983	8,417	11,900
Aug.	4,174	8,096	978	1,291	10,365	14,539
Sept.	2,541	9,397	1,119	1,299	11,815	14,356

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U. S. Imports and Production of Natural and Synthetic Rubber*

(In Long Tons)

Year	Natural	SBR	IIR	CR	NBR	Natural and Synthetic
1960						
Jan.	34,795	106,853	8,171	11,958	3,760	170,876
Feb.	40,949	104,603	6,514	12,106	3,111	173,095
Mar.	38,580	109,440	7,605	11,305	3,583	170,513
Apr.	36,343	97,963	7,958	11,879	3,095	157,238
May	32,018	102,501	9,814	11,401	3,088	158,822
June	31,639	98,635	9,475	11,614	2,823	154,186
July	28,555	95,584	8,389	10,210	2,401	144,939
Aug.	39,596	98,541	9,804	10,120	3,170	161,231
Sept.	31,853	90,392	9,183	10,078	3,190	144,706
Oct.	....	87,857	8,711	11,219	3,204	....

* Including latex.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U. S. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	CR	NBR	Total Synthetic	Natural and Synthetic
1960						
Jan.	5,493	8,094	999	1,117	10,210	15,701
Feb.	5,463	7,838	969	1,000	9,807	15,270
Mar.	4,847	8,104	1,076	927	10,107	14,954
Apr.	4,199	7,154	913	976	9,043	13,142
May	3,655	6,821	868	978	8,667	11,322
June	3,975	7,147	1,033	981	9,161	13,136
July	2,912	5,433	729	780	6,942	10,854
Aug.	3,897	7,857	1,057	1,078	9,992	13,889
Sept.	4,250	7,458	942	1,122	9,522	13,772

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U. S. Exports of Synthetic Rubber*

(Long Tons)

Year	SBR	IIR	CR	NBR	Total
1960					
Jan.	21,967	2,396	4,185	527	29,075
Feb.	22,791	1,528	4,588	740	29,647
Mar.	27,081	1,803	4,874	532	34,290
Apr.	28,765	2,006	5,268	676	36,715
May	23,337	1,936	4,213	1,320	30,806
June	23,130	2,062	3,699	464	29,355
July	19,721	3,792	4,446	616	28,575
Aug.	22,753	3,494	3,519	501	30,267
Sept.	16,836	3,497	3,341	389	24,063

* Including latices.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U. S. Reclaimed Rubber*

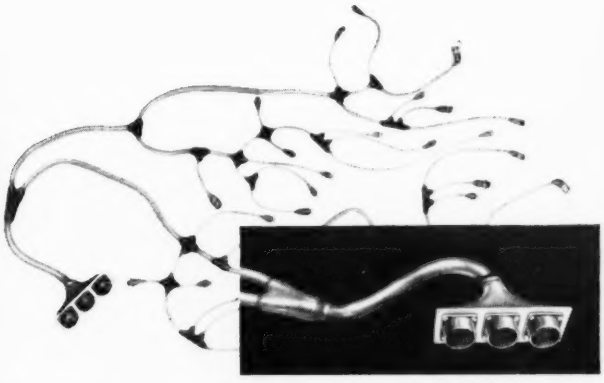
(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1960				
Jan.	26,442	26,540	1,106	29,031
Feb.	26,965	25,944	1,258	28,653
Mar.	29,100	26,625	1,542	29,719
Apr.	26,209	24,210	1,248	30,916
May	25,676	23,763	1,167	32,611
June	25,429	24,677	1,164	31,699
July	21,472	19,249	1,384	33,624
Aug.	23,565	21,452	951	33,979
Sept.	22,251	22,101	1,029	33,949
Oct.	23,546	23,269	....	33,519

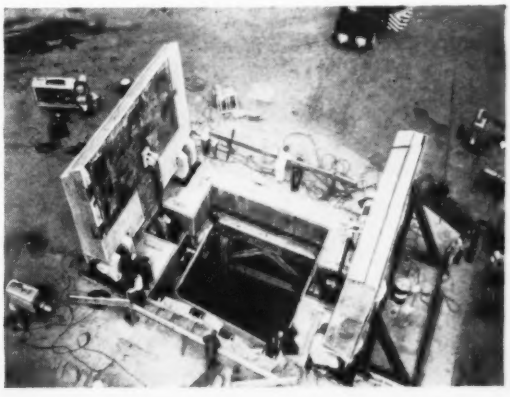
* Natural and synthetic.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

General Electric Silicone Rubber helps get Titan ICBM combat-ready

Missile and ground-support applications are "naturals" for the unique qualities of silicone rubber—heat resistance above 600°F, low-temperature flexibility to −150°F, good thermal conductivity, unexcelled ozone resistance and virtually unlimited life under normal conditions. Because it retains its excellent electrical properties over a wide temperature range, G-E silicone rubber is also used for missile wire and cable insulation. Even when continuously exposed to direct flame, it forms a non-conducting ash which gives off no toxic fumes.



Missile wiring harness — General Electric silicone rubber was chosen by Aerojet-General Corp. for the Titan's propulsion system wiring harness. Breakouts and junctions are molded from G-E RTV (room temperature vulcanizing) silicone rubber; wiring is silicone insulated; jacketing is high-strength G-E silicone rubber. Inset shows silicone rubber inserts in connectors. RTV is used in other missiles as a shock-absorbing encapsulant and potting material for electronic assemblies.



200 tons of steel and concrete — Titan missile silo doors by American Machine & Foundry Co. use seals of G-E silicone rubber. AMF also used G-E silicone rubber door seals on the Titan's ground support entry portals and radar silos. Silicone rubber can withstand the heat of rocket blast-off or possible atomic attack while remaining stable in storage for long periods.

Write for more information on G-E silicone rubber, briefly describing your application. Section 11234, Silicone Products Department, Waterford, New York.

GENERAL ELECTRIC

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya		Indonesia		All Other	Total
	Estate	Native	Estate	Native		
1960						
Jan.	37.4	27.5	18.0	28.0	59.4	170.0
Feb.	32.1	22.6	17.4	32.9	45.7	152.5
Mar.	30.0	25.0	15.8	34.8	57.0	162.5
Apr.	28.1	18.8	14.7	40.4	53.0	155.0
May	33.0	23.8	16.7	32.3	54.2	160.0
June	34.3	24.0	16.7	31.8	54.6	160.0
July	37.1	26.0	17.9	27.9	46.1	155.0
Aug.	36.1	26.0	16.9	17.3	59.2	152.5
Sept.	36.6	25.1	16.3	36.8	56.7	167.5
Oct.	37.0	26.0	...	...	...	...

Source: Secretariat of the International Rubber Study Group.

World Consumption of Natural Rubber*

(1,000 Long Tons)

Year	U. S.	Eastern Europe and China†	U. K.	France	Germany	World Total†
1960						
Jan.	46.4	45.4	14.7	11.2	11.8	182.5
Feb.	46.0	31.9	14.3	11.4	12.3	172.5
Mar.	47.2	15.0	17.3	12.1	13.1	162.5
Apr.	42.0	26.9	13.5	11.0	11.0	160.0
May	41.3	24.9	14.3	11.2	11.9	160.0
June	42.6	35.9	16.4	11.2	10.8	175.0
July	35.2	29.8	11.2	10.3	10.8	155.0
Aug.	37.3	31.5	10.2	4.0	11.3	152.5
Sept.	36.8		16.7	...	11.8	165.0
Oct.	37.0	...	14.2	...	...	...

* Figures include latices.
† Estimated or partly estimated.
Source: Secretariat of the International Rubber Study Group.

World Production of Synthetic Rubber*

(1,000 Long Tons)

Year	U. S.	Canada	Germany	U. K.	Italy	Japan	Total
1960							
Jan.	130.7	12.6	5.9	6.0	5.0	..	165.0
Feb.	126.3	12.9	5.8	5.8	5.0	..	160.0
Mar.	131.9	14.2	7.3	7.7	5.5	..	165.0
Apr.	120.9	13.2	7.0	6.9	5.5	1.1	157.5
May	126.8	13.5	5.6	6.2	5.5	1.8	162.5
June	122.5	13.5	5.4	8.1	5.5	3.3	160.0
July	116.6	12.8	7.8	7.4	6.0	3.5	157.5
Aug.	121.6	12.7	7.2	7.9	6.0	2.1	160.0
Sept.	112.9	12.7	6.0	8.2	6.5	.8	150.0
Oct.	111.0	..	..	6.3	6.5	...	...

* Figures include latices. No data available from Iron Curtain countries.
Source: Secretariat of the International Rubber Study Group.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U. S.	Canada	U. K.	France	Germany	Japan	Total†
1960							
Jan.	95.1	4.8	8.4	6.9	7.3	3.9	142.5
Feb.	93.2	5.2	8.5	7.5	8.3	4.2	145.0
Mar.	97.7	5.4	10.5	8.1	9.0	4.6	155.0
Apr.	90.3	4.4	8.4	7.6	7.7	4.8	145.0
May	92.0	4.2	9.0	8.0	8.9	4.9	147.5
June	95.8	5.0	10.0	8.0	8.2	4.9	152.5
July	79.4	3.9	7.8	7.4	8.4	5.4	132.5
Aug.	88.6	3.8	7.0	3.2	9.1	5.4	142.5
Sept.	87.3	5.0	11.3	..	9.4	5.4	150.0
Oct.	88.8	..	9.6	..	..	..	....

* Including latices.
† Figures estimated. No account has been taken of synthetic rubber originating in Eastern Europe.
Source: Secretariat of the International Rubber Study Group.

U. S. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Values of Sales*				Manufacturers' Inventories*			
	1957	1958	1959	1960	1957	1958	1959	1960
Jan.	496	448	508	530	1,047	1,100	1,013	1,140
Feb.	495	413	490	540	1,036	1,087	1,032	1,140
Mar.	476	412	506	510	1,030	1,112	1,030	1,160
Apr.	490	429	543	530	1,031	1,047	1,015	1,190
May	481	428	524	550	1,024	1,020	995	1,180
June	458	445	520	520	1,027	986	1,013	1,200
July	514	478	519	480	1,045	980	1,075	1,230
Aug.	481	438	492	480	1,074	1,024	1,113	1,240
Sept.	481	464	544	510	1,074	1,024	1,114	1,210
Oct.	490	493	555	490	1,097	1,022	1,115	1,160
Nov.	431	472	482	.	1,101	1,018	1,120	...
Dec.	427	518	508	.	1,092	994	1,124	...
Total	5,720	5,438	6,191	...	12,678	12,414	12,759	...

* Adjusted for seasonal variation.
Source: Office of Business Economics, United States Department of Commerce.

U. S. Tire Fabric Production

(Thousands of Pounds)

	Tire Cord & Fabrics			Chafer & Other Fabrics		
	Nylon	Rayon	Cotton	Nylon	Cotton	Total
1960						
Apr.-June*	41.2	64.7	8.0	2.3	7.9	116.9
July-Sept.	32.9	51.8	6.3	1.9	5.8	93.1
Oct.-Dec.	28.9	54.4	5.5	2.4	4.8	91.2

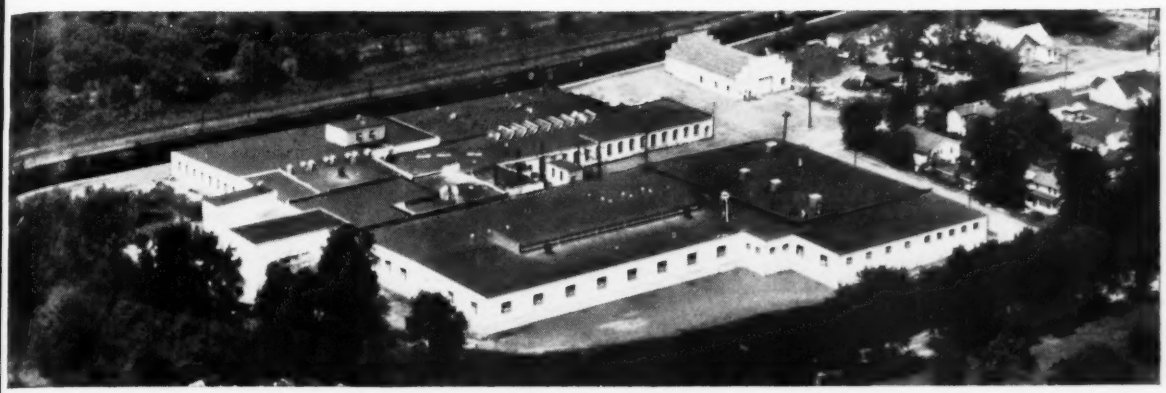
* Breakdown between nylon and cotton tire fabric production not available for earlier periods.
Source: Bureau of the Census, United States Department of Commerce.

U. S. Rubber Industry Economic Indicators

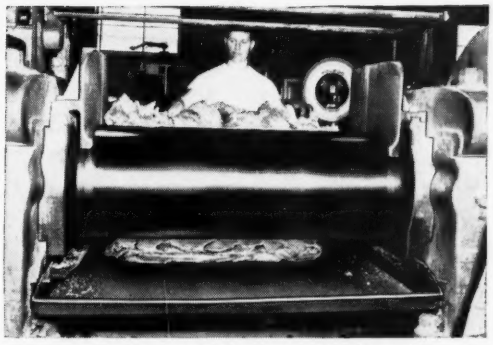
Year	Production Index* Total Rubber and Plastics Products Seasonally Adjusted, %		Without Seasonal Adjustment, %		% Return† On Sales	% Return† On Investment
	1947-49	1957	1947-49	1957	R&MP‡	R&MP
	100	100	100	100		
1959	109	114	199	114	4.0	8.6
Jan.	189	108	198	113		
Feb.	197	113	208	119		
Mar.	196	112	206	118	3.9	8.0
Apr.	182	104	187	107		
May	183	105	179	103		
June	205	117	199	114	4.4	10.4
July	223	128	187	107		
Aug.	210	120	203	117		
Sept.	209	120	212	121	4.1	8.8
Oct.	201	115	211	121		
Nov.	198	113	203	116		
Dec.	203	116	194	111	3.7	8.0
1960						
Jan.	206	118	216	124		
Feb.	201	117	215	123		
Mar.	201	115	211	121	3.8	8.0
Apr.	201	115	201	118		
May	205	117	201	115		
June	214	122	208	119	3.9	8.4
July	204	117	177	101		
Aug.	201	115	191	109		

* F.R.B. Index of Industrial Production revised to include plastics products and change base period.
† Base Data F.I.C.-S.E.C.-Quarterly Financial Reports—% Calculated by RMA.
‡ R&MP = Rubber and Miscellaneous Plastics, a classification revised according to the 1959 Standard Industrial Classifications.

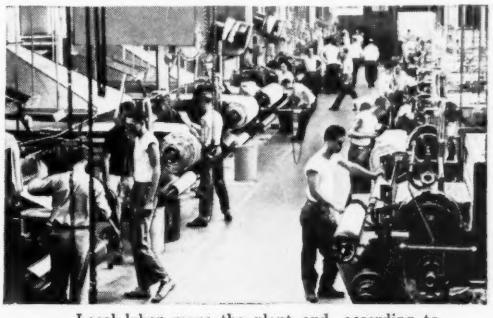
REEVES BROTHERS, INC.
finds quick-to-learn, easy-to-train workers in VIRGINIA !



Reeves-Vulcan coated fabric plant at Buena Vista, Virginia, was built in 1953. Plant covers over 100,000 sq. ft. . . . has ample room for expansion . . . is served by railroad and Virginia's excellent highways.



Reeves-Vulcan Division makes Durofyne offset printing blankets . . . Vulcan diaphragms for gas meters . . . Coverlight for trucks and boats . . . Coated fabrics for rainwear, life rafts, wading pools, air mattresses . . . Reevecote for gaskets, oil seals, cable wrappings, etc.



Local labor mans the plant and, according to management, is quick to learn. Buena Vista is located in beautiful Shenandoah Valley near Lexington, historic college town. Recreational facilities are excellent, climate is mild.

When Reeves Brothers, Inc. decided to move its Vulcan Division to a more advantageous location, they chose Buena Vista, Virginia. Records of the Virginia plant prove the wisdom of this choice. Over a period of 7 years, training time for local unskilled employees has been reduced from 6 months to about 4 weeks. These quick-to-learn Virginians keep production efficiency high, customer complaints low . . . and the plant has operated since May, 1956, without a single disabling injury. A record of over 3,000,000 safe man-hours was compiled and the plant has won the National Safety Council Award in its class for 4 consecutive years — a tribute to the skill and responsibility of its personnel.

Find out more about the production advantages of Virginia. In confidence, phone, wire or write . . .

C. M. NICHOLSON, Jr., Commissioner
Division of Industrial Development and Planning
Virginia Dept. of Conservation and Economic Development
Room 810-RW State Office Bldg., Richmond 19, Va.
Phone: MIlton 4-4111, Ext. 2255

You, too, can find these... and many other great competitive advantages in **VIRGINIA**
... a wonderful place to play or work

Carbon Black Statistics—Twelve Months, 1960

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

Furnace types	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Production												
Thermal	14,746	12,438	14,690	13,481	13,337	12,004	11,481	11,237	10,574	11,621	11,770	12,054
SRF	27,138	25,673	28,063	30,176	30,380	27,179	28,879	26,802	23,856	24,644	23,753	24,185
HMF	6,645	5,919	5,777	6,883	7,361	6,889	5,492	6,103	7,246	3,736	5,210	3,470
GPF	9,462	9,722	9,833	10,420	10,711	10,792	11,315	11,284	8,883	10,703	10,651	11,808
FEF	21,450	22,599	23,423	20,449	22,938	20,825	20,449	20,444	16,588	17,022	14,093	16,775
HAF	49,793	43,816	44,466	43,049	52,592	44,695	44,694	41,082	37,800	37,424	41,509	45,384
SAF	....	1,549	1,778	2,837	357	2,051	905	1,617	547	1,164	1,649	1,152
ISAF	24,744	25,283	30,116	29,720	26,299	25,610	25,413	28,898	27,738	23,622	22,342	24,666
Total furnace	153,978	146,999	158,146	157,015	163,975	150,045	148,628	147,467	133,232	129,936	130,977	139,494
Contact types	25,590	23,503	25,099	25,155	25,105	23,643	23,928	23,994	24,058	24,653	23,561	24,066
Totals	179,568	170,502	183,245	182,170	189,080	173,688	172,556	171,461	157,290	154,589	154,538	163,560
Shipments												
Furnace types												
Thermal	19,372	9,159	14,100	12,130	12,531	11,475	9,805	12,299	12,349	12,243	11,772	9,947
SRF	25,327	25,680	29,378	28,175	25,877	23,960	24,441	25,430	25,752	23,097	24,334	21,153
HMF	5,533	6,780	6,759	6,977	5,727	5,265	4,867	5,548	4,547	3,826	4,485	3,652
GPF	8,194	9,034	9,556	11,547	11,056	10,320	9,502	9,968	10,531	10,154	11,411	10,514
FEF	20,845	20,824	22,421	19,258	17,416	20,403	17,128	17,933	19,434	19,921	16,452	16,249
HAF	45,492	42,592	44,037	45,443	39,810	43,740	35,338	46,838	37,787	37,887	43,097	38,921
SAF	826	993	1,483	1,559	1,861	1,505	1,801	894	729	1,638	954	967
ISAF	23,034	27,284	28,253	26,101	26,026	27,838	26,643	23,529	25,105	26,387	25,048	23,407
Total furnace	148,623	142,346	155,987	151,190	140,304	144,506	129,525	142,439	135,234	135,153	137,553	124,810
Contact types	40,807	15,474	23,666	26,247	22,493	20,806	20,258	24,663	24,073	21,787	26,015	20,782
Totals	189,430	157,820	179,653	177,837	162,797	165,312	149,783	167,102	159,307	156,940	163,568	145,592
Producers' Stocks, End of Period												
Furnace types												
Thermal	16,097	19,376	19,966	21,317	22,123	22,652	24,328	23,266	21,491	20,869	20,867	24,974
SRF	24,506	24,543	23,228	25,229	29,732	32,951	37,389	38,761	37,865	39,412	38,831	41,863
HMF	4,894	4,033	3,051	2,957	4,591	6,215	6,840	7,395	10,094	10,004	10,729	10,360
GPF	6,253	6,941	7,218	6,091	5,746	6,218	8,031	9,347	7,699	8,248	7,488	8,782
FEF	10,957	12,732	13,734	14,925	20,447	20,869	24,190	26,701	23,855	20,956	18,597	19,123
HAF	35,630	36,854	37,283	35,092	47,874	48,829	58,185	52,429	52,442	51,979	50,391	56,819
SAF	3,254	3,810	4,105	5,383	3,879	4,425	3,529	4,252	4,070	3,596	4,362	4,547
ISAF	30,364	28,363	30,226	33,845	34,118	31,890	30,660	36,029	38,662	35,895	33,189	34,440
Total furnace	131,955	136,652	138,811	144,839	168,510	174,049	193,152	198,180	196,178	190,959	184,454	198,908
Contact types	52,025	60,054	61,487	59,995	62,607	65,444	69,114	68,445	68,430	71,296	68,842	72,126
Totals	183,980	196,706	200,298	204,834	231,117	239,493	262,266	266,625	264,608	262,255	253,296	271,034
Exports												
Furnace types												
Total furnace	37,598	26,574	35,408	41,367	30,769	30,319	29,120	32,661	36,876	29,971	34,963	....
Contact types	23,310	10,635	8,920	13,862	8,774	10,526	8,630	13,591	10,361	9,874	14,139	....
Totals	60,908	37,209	44,328	55,229	39,543	40,845	37,750	46,252	47,237	39,845	49,102	....

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

U. S. Rubber Use by Products

(1,000 Long Tons)

Year	Transportation			Non-Transportation			Grand Total
	Natural	Synthetic	Total	Natural	Synthetic	Total	
1956	364.0	533.0	897.0	198.1	341.3	539.5	1,436.5
1957	342.7	583.5	926.2	196.0	342.4	538.5	1,464.6
1958	302.0	558.9	860.9	182.4	321.0	503.5	1,364.4
1959	354.7	669.6	1,024.3	200.4	401.7	602.1	1,627.7
1959							
3rd qt.	94.0	182.7	276.7	49.7	98.8	148.6	425.8
4th qt.	86.7	167.2	253.8	47.4	104.4	151.7	406.0
1960							
1st qt.	94.8	176.1	270.9	44.8	110.0	154.7	425.7
2nd qt.	87.2	176.7	263.9	38.7	101.4	140.0	404.0
3rd qt.	73.7	160.4	234.0	35.6	95.0	130.5	364.5

Source: United States Department of Commerce, Business & Defense Services Administration.

U. S. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments				Production	Inventory End of Period
	Original Equipment	Replacement	Export	Total		
1959	3,624	41,522	890	46,036	46,059	10,536
1960						
Mar.	365	2,807	111	3,282	4,241	10,113
Apr.	330	2,862	114	3,306	3,628	10,495
May	307	2,932	91	3,330	3,611	10,852
June	295	3,154	98	3,547	3,426	10,670
July	242	3,102	94	3,439	3,261	10,627
Aug.	169	3,056	83	3,308	3,017	10,254
Sept.	232	2,563	100	2,894	3,024	10,446
Oct.	222	2,666	111	3,000	3,067	10,589
Nov.	229	2,354	74	2,657	2,921	10,859

Source: The Rubber Manufacturers Association, Inc.

caught in the middle?

YOU CAN'T CONTROL THE "FLOW" OF TRAFFIC ON THE ROAD -- But -- YOU CAN CONTROL THE "FLOW" IN YOUR PLANT!

USE AQUAZINC KC CONCENTRATE

to separate sheet or slab stock
and lubricate with perfect tack control

Aquazinc KC Concentrate, a highly concentrated zinc stearate dispersion, is applied as a spray or dip. It does the following for you:

1. Eliminates the health and explosion hazards of dusting.
2. Eliminates the need for liners or cushions.
3. Gives smooth flowing stock plus perfect tack control (it's developed especially for sheet mill or slabbed stock).
4. Readily absorbed without affecting the stock.
5. Leaves a glossy, non-greasy finish that adds appearance appeal.

MANUFACTURERS OF CHEMICALS

BEACON Chemical Industries, Inc.
33 RICHDALE AVENUE, CAMBRIDGE 40, MASS.

U. S. Rubber Industry Employment Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121.0	$27.84	39.9	$0.75	
1960					
Jan.	208.0	102.16	40.7	2.51	125.4
Feb.	208.6	100.00	40.0	2.50	126.5
Mar.	207.5	97.10	39.4	2.48	125.7
Apr.	200.7	94.60	38.3	2.47	126.2
May	197.6	100.04	39.7	2.52	126.3
June	197.9	102.72	40.6	2.53	126.5
July	191.7	103.53	40.6	2.55	126.6
Aug.	197.0	100.15	39.9	2.51	126.6
Sept.	198.1	....	....	....	126.8
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1960					
Jan.	19.0	79.40	39.5	2.01	
Feb.	19.0	77.21	38.8	1.99	
Mar.	18.9	78.61	39.5	1.99	
Apr.	18.5	77.01	38.7	1.99	
May	18.1	81.40	40.1	2.03	
June	18.2	82.82	40.6	2.04	
July	17.6	82.21	40.3	2.04	
Aug.	18.4	81.20	40.2	2.02	
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1960					
Jan.	77.9	119.80	40.5	2.98	
Feb.	77.4	117.71	39.5	2.98	
Mar.	78.8	113.68	38.8	2.93	
Apr.	78.1	107.38	36.9	2.91	
May	77.0	117.51	39.7	2.96	
June	76.6	121.39	40.6	2.99	
July	75.9	123.71	41.1	3.01	
Aug.	75.9	115.25	39.9	2.94	
Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1960					
Jan.	111.1	93.52	41.2	2.27	
Feb.	112.2	91.76	40.6	2.26	
Mar.	109.8	89.78	39.9	2.25	
Apr.	104.1	88.43	39.3	2.25	
May	102.5	90.12	39.7	2.27	
June	103.1	92.34	40.5	2.28	
July	98.2	91.66	40.2	2.28	
Aug.	102.7	91.88	40.3	2.28	

Source: BLS, United States Department of Labor.

U. S. Automotive Pneumatic Casings

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
			Passenger Car			
1959	29,768	66,834	788.3	97,388	102,681	23,599
1960						
Jan.	3,912	6,006	111	10,030	9,011	22,567
Feb.	3,569	5,257	78	8,804	9,371	22,972
Mar.	3,333	5,156	90	8,578	9,679	24,144
Apr.	3,200	6,558	114	9,872	9,165	23,512
May	3,361	6,542	78	9,981	9,548	22,985
June	3,098	7,099	94	10,290	9,544	22,271
July	2,456	6,377	82	8,915	8,680	22,097
Aug.	1,359	6,389	76	7,824	8,061	22,326
Sept.	2,676	5,749	59	8,484	8,158	22,037
Oct.	3,342	5,366	53	8,760	8,461	21,816
Nov.	3,171	4,123	55	7,348	7,979	22,493
			Truck and Bus			
1959	4,407	10,015	644	15,075	15,238	....
1960						
Jan.	421	826	45	1,292	1,315	3,376
Feb.	428	789	59	1,275	1,401	3,502
Mar.	421	671	67	1,158	1,436	3,777
Apr.	385	790	68	1,207	1,321	3,982
May	363	764	80	1,207	1,321	3,982
June	352	785	80	1,216	1,319	4,087
July	279	851	68	1,197	1,109	4,011
Aug.	219	823	75	1,117	1,085	3,972
Sept.	273	811	61	1,146	1,026	3,856
Oct.	247	938	68	1,254	1,069	3,683
Nov.	255	649	51	955	1,066	3,797
			Total Automotive			
1959	34,183	76,848	1,433	112,465	117,918	26,955
1960						
Jan.	4,333	6,833	156	11,322	10,325	25,943
Feb.	3,996	6,047	136	10,179	10,772	26,473
Mar.	3,753	5,827	157	9,737	11,115	27,921
Apr.	3,584	7,347	182	11,114	10,517	27,401
May	3,724	7,306	157	11,188	10,779	26,967
June	3,449	7,884	174	11,507	10,863	26,359
July	2,735	7,228	150	10,113	9,789	26,108
Aug.	1,578	7,213	151	8,941	9,147	26,298
Sept.	2,950	6,560	120	9,630	9,184	25,893
Oct.	3,589	6,304	121	10,014	9,530	25,499
Nov.	3,425	4,772	105	8,303	9,044	26,290

Source: The Rubber Manufacturers Association, Inc.

Business Computers

(Continued from page 51)

ferro-magnetic metals on a thin glass plate or other material. The film, which enables the computer to get information from its memory bank a thousand times as fast as vacuum tubes, relays, and other presently used devices, Remington Rand says, will speed up tremendously the operations of the computer.

The real-time system uses a variety of devices to eliminate the lag between feeding in data and obtaining results in order to provide data for rapid decisions based on what is happening now rather than what has occurred at some time in the past.

The COBOL compiler reduces program time from two to three weeks to two days, and program updating time from two to three weeks to two hours, the company claims, reduces training time for programmers, and makes for easier understanding of computer operations by top management and others without technical computer training. This compiler also makes it possible for systems analysts to prepare their own problems for computer operation.

Delivery time for both the 1107 thin-film computer and the real-time system is 18 months to two years following acceptance of contract. Rental for the 1107 is $40,000 to $60,000 a month, for the 490 Real-Time System $20,000 to $40,000 a month. A COBOL English language compiler is available for the Univac II data processing system, and will be available for the Univac Solid State 80 computer by mid-year. Other new computers will be available with COBOL compiler at time of delivery.

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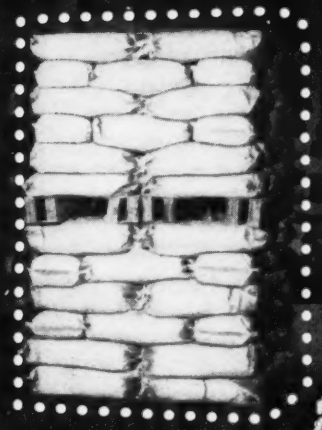
ZINC OXIDE

Two units on left contain 84 bags—
2.1 tons conventional zinc oxide.
(Each unit 6 bags per layer, 7 layers high.)

Two units on right contain 96 bags—
2.4 tons Protox-267 zinc oxide.
(Each unit 8 bags per layer, 6 layers high.)



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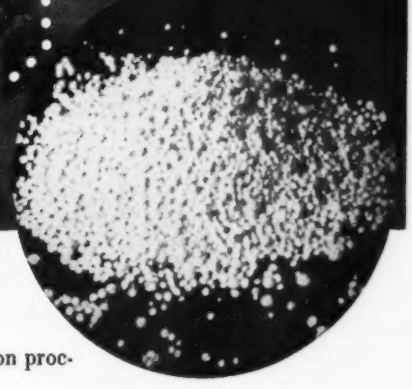

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You will save on unloading costs. You will save on storage costs. You will save on processing costs.

PROTOX-267 bulks about half that of conventional zinc oxides. A 50-pound bag occupies less than 1 cubic foot of space. It flows freely . . . can be weighed out faster. Long before the pigment enters your processing operation you can start counting your savings.

But the most important savings come from PROTOX-267's faster incorporation and dispersion in rubber. The unique coating* of zinc propionate on the pigment particles makes for rapid and thorough dispersion. There are no aggregates . . . no undispersed pigment . . . no spotty cures.

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U.S. Patent 2,303,330

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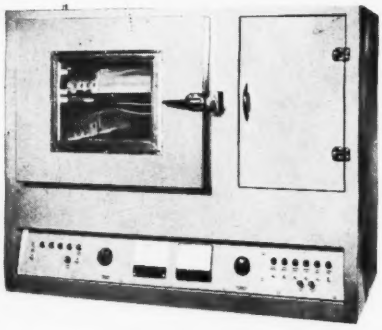
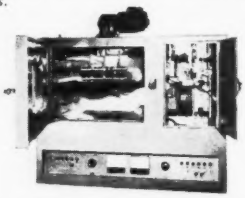


Orec 0300 Series employ an *electronic-chemical loop feed back servo system to achieve and precisely maintain chamber ozone concentrations.



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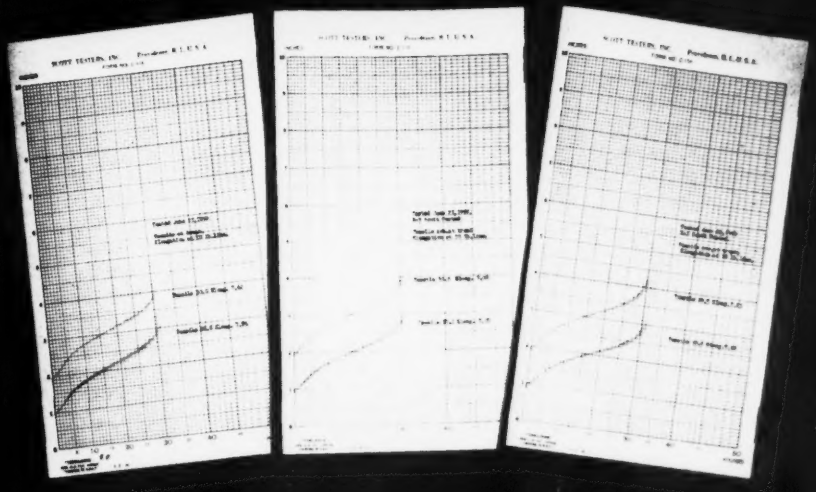

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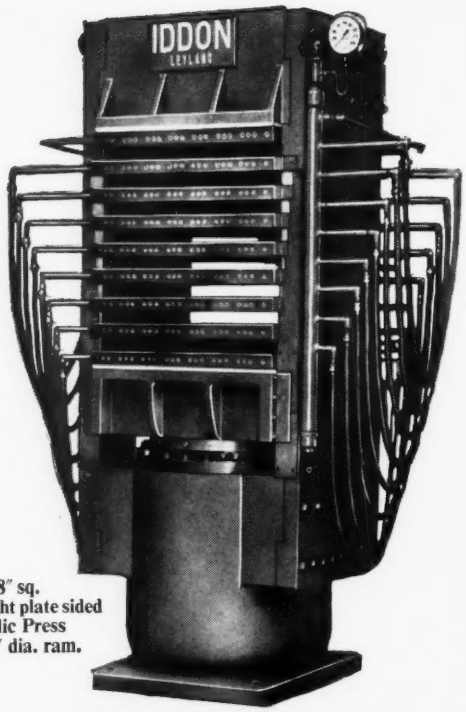

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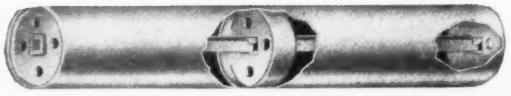

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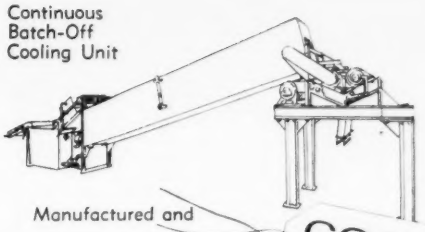

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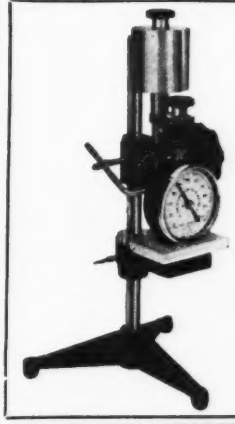

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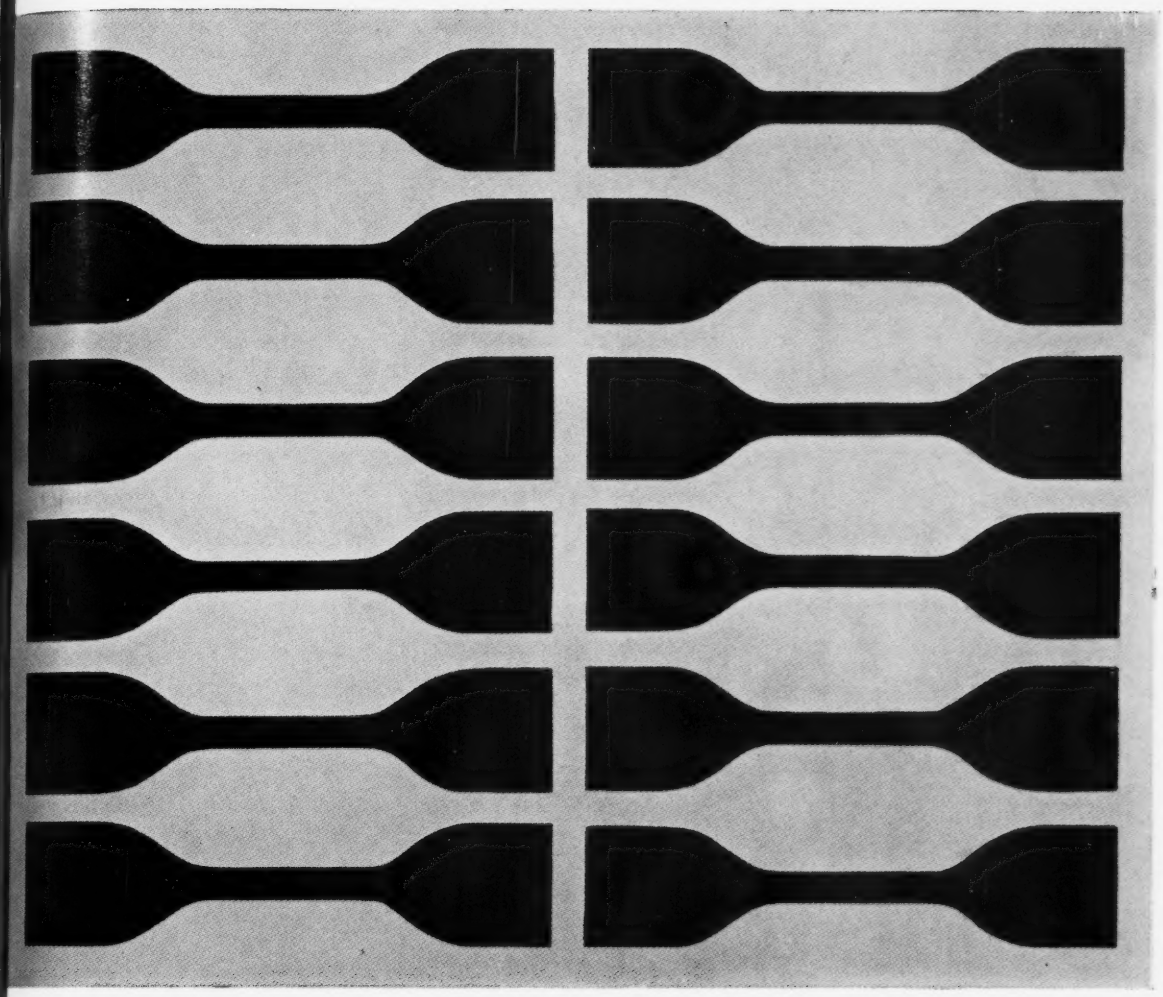

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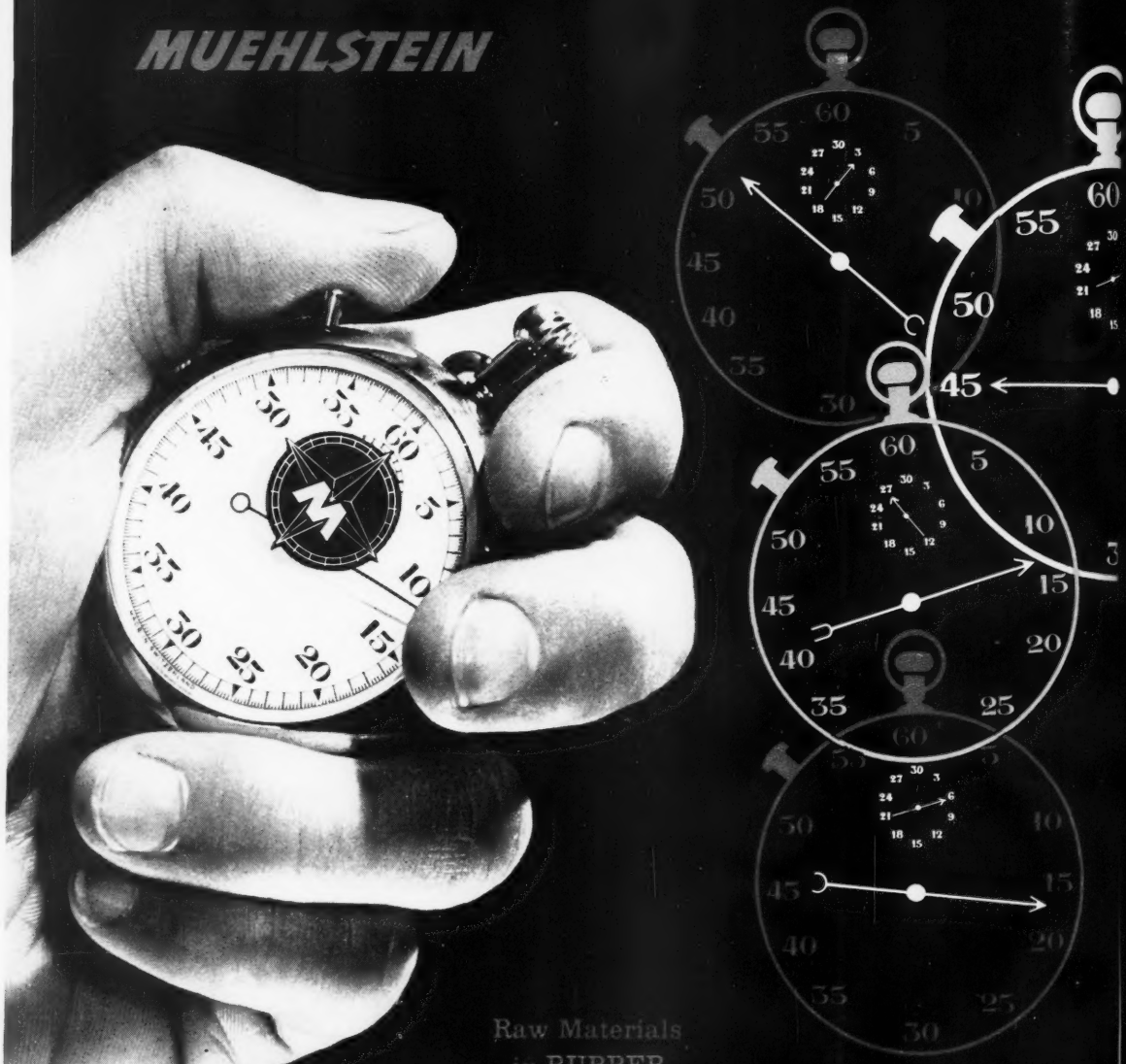

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